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Including the Proceedings of the
AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XIV NOVEMBER 30, 1925 NUMBER 20

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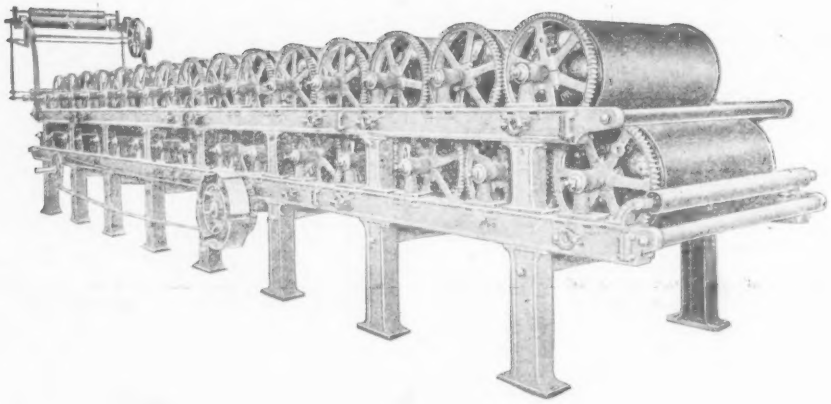

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The sticky deposit clinging to these fibres will result in a defective spot. The mill's water supply is directly responsible for such deposits. From an unretouched photomicrograph.

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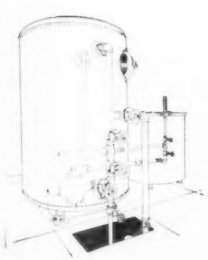

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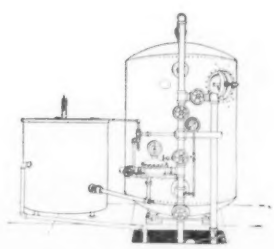

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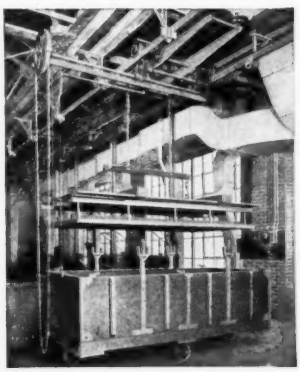

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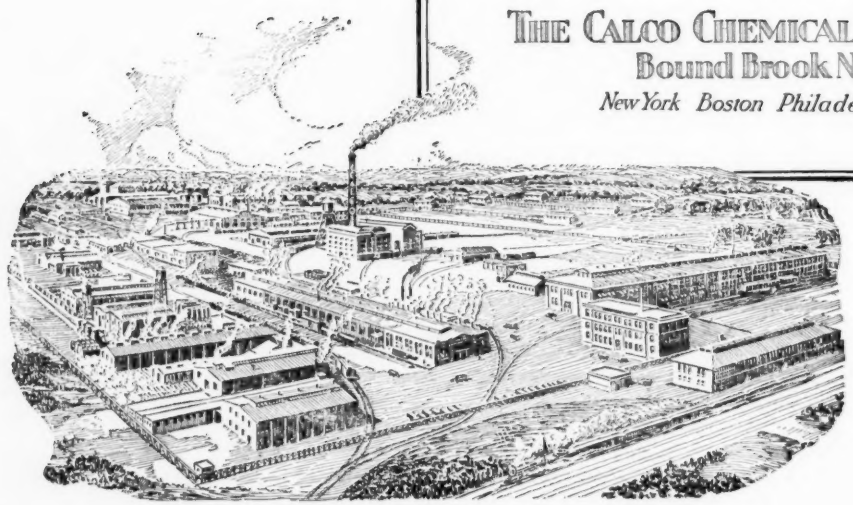

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VOLUME XIV NEW YORK, NOVEMBER 30, 1925 NUMBER 20

The Preparation and Dyeing of Cotton Knit Goods

Impurities in Cotton—Necessity of Removal or Separation—Methods for Removal—Separation and Dyeing in One Operation

By HERBERT C. ROBERTS

COTTON knit goods are becoming more important with every succeeding year. With the high cost of textile labor the knitter is still able to offer a fabric of equal weight and yardage for about two-thirds the cost of a woven fabric. This fact, coupled with the elasticity of knit goods, makes them the ideal fabric for underwear and outerwear where a garment should give flexibility and a close fit at the same time. Knit goods are well adapted for combination with rubber goods, such as arctics, boots and galoshes. It is the knit goods used in the rubber industry that the writer wishes to consider in this article. The amount of cotton knit goods used by the rubber industry has been estimated at two million pounds a year. The writer believes this figure to be low if anything.

Before cotton knit goods can be dyed or even rubberized it must undergo a certain amount of preparing or processing. Cotton consists of about 94 to 96 per cent cellulose fiber; the remaining percentage is composed of impurities which prevent the cotton from taking the dye evenly and also prevents rubber from adhering to it evenly.

These impurities in cotton can be classified and divided into four groups: They are: 1, waxes and oily matter; 2, pigment; 3, pectins; 4, tannins.

The waxes and oily matter are not present in any significant amount as far as percentage is concerned, yet its presence is absolutely necessary in the manufacture of fine yarn without considerable waste. Dr. Schunck has found that the percentage of wax varies in different grades of cotton. American cotton contains 84 per cent of wax which is the highest amount present in ordinary grades of cotton. The lowest percentage (approximately .337 per cent) is found in East Indian cotton. The wax forms a protective film for the cotton during its growth, making it water-repellent. Thus nature provides a way to protect the cotton fibers from rainstorms, while the cotton is growing. This wax gives a certain amount of lubrication to the cotton during the spinning operation.

There is oil present in cotton which is analogous to cotton-seed oil. It is probable that in the ginning process some of the seeds are ruptured, and the small amount of oil present is a contamination rather than a natural impurity.

The pigment impurities in cotton give it its color or tinge. These consist of two organic pigments which are soluble to a certain extent in alkalies. They are not harmful nor do they produce inferior goods if the cotton is graded for use. By this is meant that one should never use a cotton known as blue bender cotton for bleached sheetings as it is more suitable for colored goods. Egyptian cotton contains a dark pigment that resists bleaching.

These pigments are not injurious to subsequent dyeing operations nor will they prevent the dye from going on the goods evenly. Some of the pigments are more pronounced in their resistance to bleaching than others.

The pectins in cotton form the greatest percentage of impurities. Little is understood of their nature and properties. It is known that they cause carbohydrates, such as sugar, to jell. Alkalies decompose pectins and form metallic pectins which are soluble.

The tannins present are similar to the tannin material found in all vegetable matter. Tannin appears to be a product of leaf growth or bark growth rather than part of the ultimate fiber. It is not apt to be present in any significant amounts. If the cotton contains many seed particles and pieces of broken leaves it may, upon dyeing, have small specks that are darker in color. This is due to the formation of a tannin lake with the dye used or it may be caused by the combination of the tannin with iron in the water.

Preparation of Cotton for Dyeing

The preparation of cotton for dyeing in the past has been a lengthy and comparatively costly process. Nearly all past practices have had in view the complete removal

of foreign matter in cotton. They have all been based upon the chemical properties of the impurities. The processes commonly used in processing cotton goods are as follows:

1.—*Lime-Soda Kier Boil.*

This process consists of boiling the goods in a closed kier under pressure. The cotton wax is extremely water-repellent. It is insoluble in alkalies but upon long boiling in alkalies it is emulsified. Lime, or calcium hydrate as it is more specifically called, is a mild alkali. The lime boil usually last eight hours. It is followed by a boil with sodium carbonate to remove the lime.

2.—*Caustic Boil-out.*

This type of boil-out has replaced the previous method almost exclusively and is very efficient. It consists of boiling the goods in a closed kier under pressure with sodium hydroxide. The time required to emulsify the impurities is not as long as the lime-soda method. There are a number of drawbacks to the method. If the kier is not packed correctly the liquor will channel through the goods. The boil out will be uneven and the subsequent dyeing will be uneven. If the goods are not submerged under the surface of the liquor rusty colored stains are apt to be caused.

3.—*Use of Sulphonated Oils.*

It was found that sulphonated oils such as Turkey Red oils and the like has the property of dissolving cotton wax. Thus they were added to the kier along with the caustic soda or milder alkalies such as lime or sodium carbonate. The oils were intended to saponify, emulsify, dissolve or otherwise remove the waxes and other impurities in the cotton.

4.—*Use of Other Alkalies.*

Writers and investigators have put forth much information and literature upon the removal of the impurities in cotton based on the saponifying and emulsifying properties of various alkalies. Among the alkalies mentioned have been borax, sodium silicate, tri-phosphate of soda and others. They have all been more or less effective, but their cost has made their use as common boil-out agents prohibitive.

5.—*Use of Solvents.*

The tendency of investigation in recent years has been to eliminate as far as possible the kier boil. Yet, it is conceded by all that it is essential to use some sort of a kier boil to produce a full bleach. Where the kier boil has been eliminated, the practice has been to use a combination of emulsifying agents and solvents.

The solvents which have been used or recommended for use have for the most part been largely composed of sulphonated oils. To this base have been added such solvents as benzene, carbon tetra-chloride, carbon bi-sulphide, olein, oleic acid, turpentine, and pine oil. These have been efficient to a certain degree. The chief objection to their use in an open kettle boil-out has been that they have evaporated before they had time to exert their maximum solvent action.

Potash soaps of olive oil and red oil have been used. With them have been combined resins, pine oil, and alkalies. These have been more stable and have not evaporated on boiling. With hard water the products of the boil-out often prove almost as difficult to remove from the goods as the cotton impurities themselves.

Matthews in his fourth edition of Textile Fibers has summed up the various methods of Scheuer in his study of the saponification of tallow, cottonseed oil and the fatty constituents of raw cotton in contact with cotton cloth: "(1) Sodium hydroxide is twice as effective as sodium carbonate in equivalent concentration; increasing the concentration 5 to 10 parts per 1,000 is without sensible effect. (2) Mixtures of sodium carbonate and sodium hydroxide show a maximum efficiency when the proportion of carbonate is equivalent to 25 per cent of the total alkali, an effect which is ascribed to the mechanical properties of the solution."

More modern writers as Dr. Scott and Dr. Chapin would probably elaborate upon this statement and add with this the pH value showing the ideal conditions for emulsification and saponification. No doubt if the boil-out bath were maintained at this ratio and the pH value recorded and maintained the same, the boil-out bath could be used for several successive batches.

Matthews adds: "(3) The addition of rosin increases the velocity of the saponification, which is still further inhanced by the increasing of the concentration of the alkali; (4), the saponification of the cottonseed oil in contact with the fabric is relatively rapid, and appears to increase the rate of the saponification of the natural fatty constituents of the raw cotton; (5), neutral fats (triglycerides) are much more rapidly attacked by alkaline solutions when mixed with readily saponifiable oils, owing probably to emulsification; (6), while the rapidity of the action of lime is noteworthy, the complete removal of the fatty matter can only be effected by a subsequent acidification and boiling with sodium carbonate; (7), the general statement is made that the complete saponification of the fatty constituents of cotton may be effected by (a) a single treatment sodium hydroxide and rosin, or (b) by the lime 'sour soda ash' sequence, the latter process having the greater elasticity and certainty."

Thus it will be seen that the treatment cotton receives to rid it of its impurities is based upon the removal of the impurity that is present in a relatively small amount, namely the wax and oil. The ultimate end in view is to get each fiber thoroughly wet and absorbent. It is readily seen that if some agent could be found that would break down this barrier and wet the goods out there would be no need of entirely removing the impurities of the raw cotton.

The Use of the Hydrogenated Hydrocarbons

More chemical achievement has found agents that will wet out cotton and not necessarily remove all the impurities. When Germany was unable to procure natural

turpentine during the war she made many substitutes. Among these were some that American ingenuity has applied to the textile industry with infinite success. The success has been so remarkable that enthusiasm of the makers of these compounds has led many a cotton dyer to become skeptical of them.

These products can be classified as hydrogenated hydrocarbons. Tetralin is a hydrogenated naphthalene. When it is mixed with a suitable emulsifying agent and with a vehicle such as a sulphonated oil it becomes a valuable product for wetting out cotton.

The effectiveness of this new wetting out agent is a function of the concentration of the wetting out bath rather than the weight of the goods wet out. In the writer's experiments in using these hydrogenated hydrocarbons to prepare the goods he tried two different methods of procedure. The first method was to wet the goods out and then transfer them to the kettle into which they were to be subsequently dyed. He found that the wetting out bath could be freshened with a small addition of the wetting out agent and used indefinitely as a standing wetting out bath. The equipment at hand was not ideal to accomplish this purpose. There were no squeeze rolls on the wetting out kettle and consequently the removal of the goods was a wet, disagreeable process. If the proper equipment were at hand this method of wetting out could be done very easily and inexpensively. If a soaping machine such as is used in soaping some classes of woolen goods for fulling was available it would make an ideal wetting out machine. The bowl of the soaper should be fitted with a small indirect steam coil to heat the liquor to the proper temperature. The goods should enter the soaper, pass through the liquor under the bottom roller and up through the nip of the squeeze rolls. The excess liquor will return to the bath, while the goods will go to a suitable box or truck until enough goods are wet out to make a dye batch.

The writer has found that the most suitable and feasible way is to wet the goods out in the kettle they are to be dyed in. This presumably is the method most adaptable for most dyehouses.

The Isomerpin, with which the writer has experimented, is mixed with a small amount of water and stirred into a smooth viscose mass. The emulsion is then diluted and added to the dye kettle. The bath is then heated and the goods added.

The dye batches used in this instance are approximately 500 pounds. The amount of water used is 1,200 gallons. This is very close to a 1 to 20 ratio of goods to the liquor.

To a pail is added 1 quart of water. Into this is stirred slowly 4 quarts of Isomerpin. This becomes a heavy viscose, milky solution. The contents of the pail are added to the dye kettle that has been filled with enough water to make the goods run well. The steam is turned on and the goods are started into the kettle. When the temperature of the bath reaches 120 to 130 degrees, the steam is shut off. The goods are run at this temperature for one-half hour. The volume of the water is made up to the proper dyeing level and the dye is added. The steam is then turned on and the bath is brought up to a boil and boiled one-half hour, the salt is then added and the steam shut off. The goods are let run with the steam off for another one-half hour. They are then washed and removed from the dye kettle to be extracted.

Occasionally for some shades where the dyes used are not extra soluble such as Fast Brown M and Benzopurpurine 4B it is well to change the method slightly. Best results are obtained by using less water to start the wetting out and run the temperature up to 150 deg. Fahr., and after the goods are wet out for one-half hour cool them down by the addition of cold water to 130 deg. before the dye is added. The addition of four ounces of the wetting out agent to the dye solution during the dissolving of the dye has proved beneficial.

The cost of wetting out goods in this manner may at first glance seem high. Further analysis will show that when all the contributing factors are computed there will be a marked saving compared with some of the current practical methods of boiling out. The cost of the two quarts of the hydrogenated hydrogen will be $2.66; this constitutes the cost of all the chemicals used. The steam required to raise the the bath to 120-130 deg. will vary with the time of the year. It is safe to assure that the year round average temperature of the water entering a dyehouse will be 55 deg. Fahr. Barring radiation losses, which would be more or less of a constant in all types of these experiments, it would take 750,000 B.t.u. This in terms of steam at 60 pounds pressure would be about 725 pounds. Assuming that the steam cost 75 cents a 1,000 pounds to produce, this would be a cost of 54 cents, making a total cost of $3.20.

When the dye is added to the bath the bath is already warmed to 120 deg. Fahr.; thus the steam necessary and the time required to bring the bath up to this point is saved. The time necessary to bring the bath from the temperature of the cold water to 130 deg. Fahr. is about one-half hour. If the kettle tender is receiving 50 cents an hour and operates two kettles this is 12½ cents of his wages saved. We can say that the cost of wetting out the goods will be:

$$\frac{(\$2.66 + \$0.54) - (\$0.12\frac{1}{2} + \$0.54)}{500 \text{ pounds of goods per batch}}$$

which is equivalent to $0.00507 per pound goods wet out.

There is one indirect advantage gained by using the hydrogenated hydrocarbons that is worthy of note. Like the parent compounds from which these are made, phenol and naphthalene, they exert the disinfectant and antiseptic properties attributed to them. During the hottest and muggiest days of August the writer has never witnessed a sour smell to the goods nor has he seen the slightest sign of mildew or mold. This is true of goods that have been sized with starch and have been left damp for several days.

A New Process for Clarifying and Decolorizing Waste Waters in Plants Using and Making Dyestuffs

The Problem of Purification—Injurious Effects of Various Coloring Matters—The Preibisch Process—The Author's New Process—Most Natural Way of Treating Waste Liquors—Wood By-products—The Apparatus Employed

By DR. GUSTAVE ULLMANN, VIENNA

(*Melliand's Textilberichte*, 1925, *pages* 346-9)

Translated by Ismar Ginsberg, B.Sc., Chem. Eng.

THE purification of the waste waters in plants that use and make dyestuffs is just as difficult a problem as it is a thankless one, but to which every textile mill that dyes fabrics must give due consideration. In order to attain a satisfactory solution of this problem much time and energy have been spent in investigations, but the difficult matter has been that the products obtained in the purification of the waters are not applicable to any useful purpose in the dyeing establishment.

As far as the effect of the colored waters on vegetation and animal life is concerned, the literature is full of investigations which have proven that these waters are not poisonous in comparison with the waste waters obtained from other industries. They are, in fact, entirely harmless, and the only objection to them is their color.

Whether the purification of waste waters from a certain dyeing establishment is absolutely necessary, or whether the waste waters can be allowed to run away directly into the streams or only after running through purification boxes, is a matter which is different for each individual case. The most fortunate plants are those that can run their waste waters into the sewerage pipes of the city, and in that manner render them uninjurious. In certain cases there are no disturbances caused, because either the character of the waste waters is less injurious or the authorities are willing to put up with the practice; which, of course, may be entirely another matter in some instances. So the same waste waters from two different establishments may cause quite different disturbances. Naturally, the facts as to whether the waste waters are added to a sewerage conduit which contains much or little water and in which the current is slow or rapid, and whether the colored waters are to be mixed with uncolored waters or not—all play important roles in this connection.

Injurious Effects of Various Coloring Matters

It is possible to arrange the coloring matters according to their capacity for injury, without consideration of the quantity in which they are found in the waste waters, somewhat as follows: substantive, basic, acid, vat (particularly those that are in colloidal solution), and sulphur. Similarly the color of the dyestuff has a definite control over the injurious effect of the water. While, for example, yellow, brown and olive color tones are non-harmful, great trouble is caused by green, blue and, particularly, red colors. Then, again, the depth of color is important in all cases. The difficulty of obtaining a waste water free from color, as detected by the eye, is appreciated when it is known that Indigo in a concentration of one to twenty million parts of water is recognizable in a waste water by the bluish color of the latter, and certain basic coloring matters are almost as intense in their effect. It is now clear why it is sometimes found that certain waste waters, all of apparently the same concentration, will in one case become colorless after traveling for a few hundred feet in the waste water canal, while in another case they will remain colored. It is not altogether a question of how much coloring matter there is in the waste waters as of the particular kind of dyestuff that is present in them.

The means that have been used up to the present time for removing the coloring matter from the waste waters can be reviewed in but a few words. The waste waters are mixed with milk of lime, at times with soda, much more frequently with ferrous or ferris salts or aluminum salts, for the purpose of precipitating the coloring matter. It need not be mentioned that the cost of such treatment is considerable and, furthermore, that the proportion of the chemicals used must be changed from hour to hour, for the percentage of coloring matter in the waste waters undergoes constant variation. Then, again, there is the matter of the harmful action of the chemicals in the water, and hence they must be used in proportions that fall below the maximum limiting concentration, which in the case of lime is only 30 milligrams per liter.

The waste waters that are mixed with these different chemicals are then passed through settling channels, the size of which depends on the quantity of waste waters produced in a twenty-four-hour period.

However, it has been found that these devices work but uncertainly, and at times the liquor that comes out of the sedimentation tanks and pits is still colored.

The Preibisch Process

It appears that the best of the methods employed for clarifying waste liquors from dyeing establishments is the one known as the Preibisch process. This process depends on the presence of large surface areas and on the use of suitable clinker from lignite coal furnaces. Good results have been obtained with it in those plants where it has been employed. Certain of the coloring matters that have been mentioned and classified above can be oxidized and in this manner the dyestuff may be precipitated, but in accordance with the information available this process has been used only very slightly. The biological processes do not give very good results in any case, as the waste liquors are poor in organic matters and cannot be clarified in this manner. All these processes, however, even if they do give good results, possess one serious disadvantage in that they require the use of large surfaces, which are available only in isolated cases.

From the preceding it is now clear what the requirements of a commercially practical and effective clarifying process are. In the first place, it must be possible to operate it within a small space and with the least expenditure for labor. The general costs of the process must be small and a thorough decolorization must be secured. This applies to all classes of coloring matters that may be present in the waste liquors.

The Author's New Process

The essential features of the new process for clarifying and completely removing the color matters from waste liquors obtained in the dyeing of fabrics are as follows: In the first place, the colored waste waters are separated and kept in separate tanks as far as possible from the general wash waters. They are then subjected to a methodical and very vigorous aeration. This results in a precipitation of the vat dyestuffs. A considerable proportion of the sulphur colors are also precipitated by this process.

The waste waters obtained after clarification become clearer at once and can then be mixed with lime water; or where the price of this chemical is too high, with other chemicals such as have been mentioned heretofore. Then the waste waters are filtered through a rapid filter which occupies but small space. The sedimentation containers may be done away with in this process, or they may be made much smaller than is now customary, all the more so for the reason that in the new process the precipitation of the coloring matter at this point is only of very minor importance. The waste water is always loaded with coloring matters, and it therefore remains to remove the color from the waters in so thorough a manner that no further trouble is caused by them.

Most Natural Way of Treating the Waste Liquors

It was thought that the most natural way of treating the color liquors would give the desired results. Thus the color can be removed from the liquors if it is possible to introduce into them some substance which would be dyed by the color, and thus the waste liquor would become exhausted. It is natural that from an economic and industrial standpoint the practicality of such a process stands or falls not only according to whether or not the substance that is used for this purpose possesses a sufficient degree of absorptivity for the coloring matter in the waste liquor but also on the cost of the material, whether or not it is cheap, whether it can be put to some use after its employment for this purpose, whether there is but little trouble encountered in handling it thereafter, and, finally, whether it is possible to carry out the process successfully with only small amounts of this material.

Use of Wood By-products

Such a material is found in wood by-products, as sawdust, straws, grasses and the like. All these substances are easily obtainable and appear to be very suitable for this purpose. Under special conditions it might be wise to use mechanical wood pulp. These woody materials are suitable for treating all kinds of colored waste liquors obtained in the dyeing establishment, for the reason that, partly because of their cellulose content and partly because of their content of lignin, albumin and tannin substances, they possess the power of removing all the different classes of coloring matters from the waste waters. As has been found by the dyeing plants which have been concerned with the coloring of woods, these products possess a certain affinity for the acid colors, although in a varying degree, as well as for the basic and substantive coloring matters, and they similarly absorb with ease the sulphur and the vat dyes. It is a fact, however, that it is quite a difficult matter to absorb all of the acid colors from the waste water with the aid of these absorbents, and accordingly in those dyeing establishments where large quantities of acid colors are employed another means has been found for decolorizing the waste waters. This product is the paring waste that is obtained in the factories that work up chrome leather to leather goods. Very good results have been obtained with this substance.

Before it is possible to answer the question of a dyer whether or not sawdust and other similar products will enable him to remove the color in his waste waters, it is essential that certain favorable conditions prevail. The first condition is the degree of absorption that is exerted by the product on the coloring

matter, and this depends on the class of the dyestuffs employed. Thus these absorbents will remove quantitatively the basic, substantive and vat coloring matters. They are particularly effective in removing the color from colloidal solutions of Indigo and the like. But in the case of waste waters which contain sulphur dyestuffs, the action is considerably slower. However, these latter colors are removed to a large degree by oxidation and precipitation. The results obtained with the acid colors are, however, unfavorable.

The second question involves the quantity of coloring matter that can be absorbed by unit weight of the sawdust. The answer to this query requires another question to be answered, and that is how much coloring matter is normally found in the waste liquor. The literature is singularly free from such information, and a series of experiments made by the author has indicated that the proportion of coloring matter in the waste waters is only very small. Quantitative experiments were also made and a large number of colorimetric analyses were carried out on waste waters obtained from large dyeing and finishing works. The results obtained were very gratifying and bore out all the expectations that were hoped for from this process. It was also found possible to make calculations on the quantity of materials required to effect the decolorization and the practical results corroborated the accuracy of these calculations.

Thus, for example, in a dyeing establishment which handled approximately 3,000 kilograms of cotton yarn for dyeing only in dark shades with substantive and sulphur coloring matters, it was calculated that the daily amount of waste water obtained was approximately 250 cubic meters, and that in this water there were dissolved scarcely more than 4 to 5 kilograms of the coloring matter. This indicated a content of approximately 0.02 gram of the coloring matter per liter.

Under these conditions it is not difficult to understand that the quantity of wood shavings necessary to remove all the coloring matter which is found in the waste water is a relatively small one. In the aforementioned example, on the assumption that the amount of coloring matter taken up by the wood shavings is 2 per cent at a maximum, which is very much less than what can be obtained in the practical working of the process, it follows that the daily consumption of wood shavings or sawdust is not more than about 150 kilograms.

The development of methods for determining colorimetrically the extent to which the removal of the coloring matter was accomplished is also of great importance. For it is clear that in certain cases the color conditions under which it is necessary to work are very unfavorable. Thus, in some cases the dilution of the coloring matter was exceedingly great. There is also the case in which a great many different colors are used in the plant and the amount of coloring matter in the waste waters may vary considerably. Furthermore, the large volume of the waste water often renders it absolutely necessary that its passage through the decolorizing medium be as rapid as possible. Then, for mechanical reasons the amount of wood shavings used cannot exceed a certain maximum, and a compromising ratio must be established between the duration of the process and the length of the path through which the liquor must travel in the decoloring apparatus, so that the process becomes practical.

All these conditions are fulfilled when the waste waters are made to flow through a correspondingly large area of wood shavings and the like in a continuous stream, with the result that the wood shavings and sawdust or other similar decolorizing materials gradually become colored. Tests have shown that sawdust and wood shavings, for example, will last for approximately four working days when the speed of flow of the waste liquors is maintained constant. At the end of that time they have absorbed so much color that they have to be replaced with fresh material. This indicates that there will be in process about four to five times the quantity of wood shavings that are required for treating a day's production of waste water.

A number of experiments have been made by Dr. Kollmann, of Vienna, on this process with the idea of combining this new process with the old ones used for the same purpose, and also to determine the absorptive capacity of sawdust, the influence of the concentration of the coloring matter in the waste liquor, the time that must be allowed for contact between colored liquors and the sawdust, and the like. Another series of tests were made for the purpose of establishing which of the various materials recommended for decolorizing waste liquors gave the best results.

The conclusions derived from these experiments allowed the author to list the decolorizing agents in a regular series according to their color absorptive properties. Thus it was found that the best results were obtained with a suspension of mechanical wood pulp in water, the same mechanical wood pulp in board form being less effective. This material is, however, rather expensive and may be hard to obtain in certain dyeing establishments. It was therefore thought more advisable to use the less absorptive wood shavings or sawdust, which, it has been mentioned above, gave excellent results.

However, it was found that the absorptive capacity of sawdust depends to a large degree on the character of the wood. Thus it was established that wood shavings and sawdust obtained from mills that process hard wood gave better results than the waste from soft wood working. This is probably due to the different proportions of tannin substances, albuminous materials and the like in the different kinds of wood, and also very likely on the fact that soft wood contains a certain percentage of resinous matters which prevent the ready absorption of coloring matter by the woody fibers.

The substance which next appeared suitable for de-

(*Continued on page* 809)

Acetate Silk—Its Dyes and Their Application

SUPPLEMENTAL TO THE PRECEDING SERIES OF ARTICLES ON DYEING ACETATE SILK

Basic Dyes on Acetate Silk—Celloxan—Acetane—Increasing Fastness of Basic Dyes on Acetate Silk—The Gallocyanine Dyes—The Setacyl Dyes—Methods of Dyeing

By CHAS. E. MULLIN, M. Sc., F. A. I. C.

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SEVERAL methods of coloring acetate silk during the process of manufacture were given in Part VII (page 381). A more recent patent along the same line is that of L. A. Levy (British Patent No. 227,146; October 19, 1923), wherein it is proposed to add suitable dyes to the acetate solution of cellulose acetate just before dry-spinning.

Basic Dyes on Acetate Silk

In addition to the basic dyes given in Parts III and IV, the following basic dyes are applicable to acetate silk by Methods No. 14 and No. 15: Tannoturquoise BB, Acridine Yellow 2R and GR, Brilliant Safranine G Conc., New Magenta Crystals, Brilliant Heliotrope 2R Conc., New Blue 13535 and R Extra Conc., and Indoine N and 3B. No matter what dyestuff or method is to be used in dyeing the acetate silk, the scoured fiber should be entered into the dyebath before it has an opportunity to dry. On account of the slight reluctance of acetate silk in wetting-out, if the fiber becomes dry in spots these places will be lighter in color than those which entered the dye bath wet.

The "mordanting" effect of certain acid dyes for the basic dyes upon wool, cotton, etc., is well known by all dyers and is widely used. Recently it has been suggested to use the acid dyes in the same manner upon acetate silk. Even though the acid dye may give only a pale shade alone, due to its slight affinity for the acetate silk, it assists in obtaining deeper shades with the basic dyes, and consequently gives a better exhaustion of the dye bath. It is also claimed that certain basic dyes which were not successfully applied alone to acetate silk may be dyed upon the acid dye mordanted acetate silk. The basic dyes may be applied by Method No. 32, given on page 317 of Part V. The table given under the "Acetate Dyes," in the discussion of the acid and mordant dyes on acetate silk, gives a list of a few of the colors obtainable by topping.

Celloxan

Celloxan was discussed in Part III (pages 243 and 244), but no formula for its application was given. The application of this product is very simple, and it gives darker shades than are obtainable by means of the basic dyes alone. These shades are usually of good fastness to washing. This fastness may be still further increased by after-treating the basic dyed acetate silk with Katanol, as in Method No. 114; tannin, as in Method No. 115, or copper sulphate, as in Method No. 116.

Method No. 106: *Application of Basic Dyes with Celloxan.*—Dissolve the dyestuff in the usual manner and add it to the twenty-to-one dye bath at about 70 deg. Cent. (158 deg. Fahr.). Then add the proper quantity of Celloxan, as given in Table No. II (pages 243 and 244). Enter the acetate silk and dye for about three-quarters of an hour at 70 deg. Cent. (158 deg. Fahr.). After dyeing, hydro-extract, rinse well, brighten in a bath with 1 per cent of acetic acid at 40 deg. Cent. (104 deg. Fahr.) and dry at 30 to 40 deg. Cent. (86 to 104 deg. Fahr.) When a standing bath is used, it is generally only necessary to add about one-half the original quantity of dye and Celloxan to replenish the bath. In the case of Rhodamine 6G Extra, Rhoduline Red G, New Magenta, Diamond Fuchsine, Crystal Violet P, Methyl Violet 1B, 2B, 4B, 5B, 6B, 1R and 4R, Rhoduline Heliotrope B and 3B, and Rhoduline Blue 5B, it is advisable to add the Celloxan in two portions, adding one-half of the quantity at first and after about fifteen minutes adding the other half.

Acetane

Acetane is a product resembling Celloxan, used for the same purpose and in about the same manner. By adding Acetane to the basic dyebath deep shades are possible on Celanese with certain basic dyes which otherwise are only applicable for light shades. The Acetane has no detrimental effect upon the valuable properties of the acetate silk, and in many instances deep shades may be obtained with only 1 or 2 per cent of dyestuff.

Method No. 107: *Dyeing with Basic Dyes by Means of Acetane.*—The basic dye is dissolved in the usual manner and added to the dye bath, which should be at a temperature of about 71 deg. Cent. (160 deg. Fahr.). The proper amount of Acetane, as shown in Table No. XXII, is then added to the bath. The acetate silk is scoured as in Method No. 5 and while wet entered into the 71 deg. Cent. (160 deg. Fahr.) dye bath. After working for

one-half to three-quarters of an hour, the material is squeezed, rinsed well and brightened with 1 per cent of acetic acid at 40 deg. Cent. (105 deg. Fahr.). Dry at about 32 to 40 deg. Cent. (90 to 105 deg. Fahr.) Where a standing bath is used, the quantity of Acetane used may be reduced proportionately. The colors obtained from the dyes marked (*) are particularly fast to light.

TABLE NO. XXII

QUANTITY OF ACETANE TO BE USED WITH VARIOUS DYES

Name of Dyestuff	Weight of Acetane in Ounces per Ten Gallons of Dye Bath
Auramine G	16.0
*Auramine O and II	32.0
Phosphine GG, GR and RE	24.0
Vitoline Pure Yellow 6G	24.0
Vitoline Yellow 5G, G, R and 2R	24.0
Vitoline Orange N	24.0
Chrysoidine GG, G, 2GR and R	24.0
*Carthamine B, G and 6G	24.0
*Cerise B and G	24.0
*Magenta	24.0
Safranine G and N	6.4
*Crystal Violet	8.0
*Methyl Violet 10B, 5B, 2B, B, R, 3R and 5R	8.0
Red Violet	16.0
*Basilene Brilliant Blue 5B	24.0
Methylene Blue B, BG and M	24.0
Navy Blue B, R and 2R	24.0
Victoria Blue B and RBN	24.0
Sapphire Blue G, R and 3R	24.0
*Basilene Blue AZG and AZR	24.0
*Malachite Green	24.0
*China Green 4GN, G, 3G, G2N and B	24.0
Methyl Green	24.0
*Brilliant Green	24.0
Bismarck Brown 2G	32.0
Phenylene Brown 2G	32.0
New Gray	32.0
*Basilene Black AZ	24.0

PATENTS COVERING THE "ASSISTANTS"

Some of the early patents covering the use of assistants in the application of basic dyes were given on page 243 of Part III. United States Patent No. 1,517,581, which follows, appears to cover the same process as British Patent No. 215,373, which was erroneously given in Part VII, page 382. This patent was superseded by British Patent No. 216,838. United States Patent No. 1,517,581, December 2, 1924, to P. Rabe, assignor to F. Bayer & Co., states that in dyeing acetate silk, cellulose esters or transformation products with basic dyestuffs, the absorption of the dyestuff may be increased by adding pyridine or one of its derivatives—for instance, methyl or aminopyridine—to the dye bath. The added substance is later removed from the fiber by washing the dyed material with acetic or formic acid.

British Patent No. 216,838, May 28, 1923, to F. Bayer & Co., possibly covers products such as Celloxan and Acetane. This patent states that in dyeing acetate silk (or other cellulose esters or their transformation products), a salt of an oxyacid or nitrogen or chlorine may be added to the dye bath in order to obtain deeper shades without using protective colloids. For instance, aniline nitrate may be used with Chrysoidine G, or sodium nitrate with Crystal Violet P. Nitrates of ammonia, sodium, magnesium, calcium and zinc, or of organic bases such as mono-methylaniline, di-methylaniline, guanidine, pyridine or piperidine may be used, as may also their chlorates. Methylene Blue, Rhoduline Red B, Safranine, Auramine and Bismarck Brown are also suitable dyes for use by this process.

Method No. 108: *Assistants for Basic Dyes on Acetate Silk.*—For example, one part of Chrysoidine G may be dissolved in 1,000 parts of water and five parts of aniline nitrate added. The dye bath should be in a proportion of about twenty to one, at a temperature of 70 deg. Cent. (158 deg. Fahr.), and the material dyed for at least one-half hour. Other inorganic and organic nitrates are mentioned, and in another example it is suggested to use five parts of sodium nitrate in place on the aniline nitrate, with the same quantity of dyestuff and water. A chlorate may be substituted for the nitrate.

R. Metzger, in United States Patent No. 1,532,427, April 7, 1925, states that glyceryl acetate, or other organic acid esters of glycerol, is frequently added to cellulose esters during manufacture in order to render the artificial silk more susceptible to dyeing. Such compounds have also been used in the dye bath, but are liable to attack or even destroy the fiber. In order to avoid this deleterious action and at the same time increase the affinity of the acetate silk for dyestuffs, he suggests treating the fiber with a solution of an ester of a mineral oxygen acid, especially salts of acid esters of a mineral oxygen acid, such as acid esters of sulphuric, phosphoric or boric acid. The treatment with these esters or ester salts may be given in a bath previous to dyeing, or the compound may be added to the dye bath, treating at either ordinary temperature for a considerable time or at a higher temperature for a shorter time.

Method No. 109: *Potassium Ethyl Sulphate as Assistant.*—For example, 10 kilograms of acetate silk may be treated for about ten minutes at 50 to 60 deg. Cent. (122 to 140 deg. Fahr.) with 300 liters of a 50 per cent, by weight, solution of potassium ethyl sulpphate containing a little acetic acid. The treated acetate silk is hydroextracted, stretched and dyed without rinsing with 1 per cent of Diamond Green B in a bath slightly acidulated with acetic acid.

Method No. 110: *Sodium Discresyl Phosphate as Assistant.*—According to the same patent, 10 kilos of acetate silk may be entered into a 200-liter dye bath at 40 deg. Cent. (104 deg. Fahr.), containing 100 grams of Auramine II, a little acetic acid and 6 kilos of a 30 per cent aqueous solution of sodium dicresyl phosphate.

Method No. 111.—In the same manner 1 kilo of acetate silk may be worked for ten minutes in 30 liters of a 5 or 6 per cent aqueous solution of sodium dicresyl phosphate, either at ordinary or an elevated temperature. It is then wrung out, stretched and dyed with 0.8 per cent of Methyl Violet 2B Extra at from 40 to 70 deg. Cent. (104 to 158 deg. Fahr.), with or without the addition of purified waste sulphite cellulose liquor. Or the pretreated fiber may be dyed with 1 per cent of Azoflavine RS in a dye bath slightly acidified with acetic acid, in place of the Methyl Violet.

Method No. 112.—If preferred, 1 kilo of the acetate silk may be treated at 40 to 50 deg. Cent. (104 to 122 deg. Fahr.) with 30 liters of a 10 per cent solution of sodium dicresyl phosphate, wrung out and dyed at 40 deg. Cent. (104 deg. Fahr.) with 10 per cent of Indanthrene Blue GCD Paste (Colour Index No. 1113), with or without the addition of a protective colloid, in a dye bath of which each liter contains 3 c.c. of 40 deg. Be. caustic soda solution, 2 grams of sodium hydrosulphite powder and 10 grams of calcined Glauber salt.

According to Haerry, "Artificial Silks," very good results along the same line as that obtained by means of Celloxan and Acetane—i. e., a better exhaustion of the dye bath and an increased fastness with basic dyes—may be had by using certain soluble zinc salts, such as zinc chloride, nitrate, or preferably the acetate, in the dye bath. He compares the action of these salts to the "salting-out" action of sodium chloride or sulphate in the application of the direct dyes to the cotton. In some cases the zinc salt precipitates the basic dyestuff directly, in which case considerable care must be exercised in its use and the presence of acetic acid in the dye bath may be advantageous. The zinc salt should only be added in solution. The action of the zinc salt is particularly noticeable in the case of basic dyes which do not exhaust well or give deep shades on acetate silk alone, such as Magenta, Victoria Blue, Phosphine, Auramine, etc., in which case the zinc may double the depth of shade, with a consequent saving where a standing dye bath is not used. Furthermore, it will shorten the time of dyeing and allow lower temperatures to be used in the dye bath, both of which are an advantage when working with acetate silk. It also increases the fastness to rubbing; but in case this is not sufficient, the dyed acetate silk may be rinsed for fifteen minutes at 80 deg. Cent. (176 deg. Fahr.) in water containing about 2 per cent of acetic acid.

Method No. 113: *Applying the Basic Dyes with Zinc Salts.*—For light shades prepare the fifteen or twenty to one dye bath with about half the required amount of dyestuff and a little acetic acid. For dark shades the dye may all be added at the start. Enter the skeins lukewarm and after working a few times remove them and add the remainder of the dyestuff in solution. Immerse the skeins again and slowly raise the temperature to 50 deg. Cent. (122 deg. Fahr.). Continue working at this temperature until very little color is going onto the fiber, and then start adding the zinc salt (in solution) in small portions, gradually raising the temperature to 44 or 66 deg. Cent. (130 to 150 deg. Fahr.). The amount of the zinc salt varies with the particular dyestuff used, and is best determined by experiment. It has been stated that the presence of acetin or glucose in the dye bath aids in leveling.

Increasing the Fastness of Basic Dyes on Acetate Silk

Method No. 114: *Katanol After-Treatment to Increase Water Fastness of Basic Dyeings on Acetate Silk.*—After dyeing and rinsing the acetate silk, but before drying it, enter it in a cold bath containing 3 to 6 per cent of Katanol and work it for twenty to thirty minutes. It may then be rinsed again and dried.

Method No. 115: *Tannin Treatment for Increased Fastness to Washing.*—In the same manner the fastness may be increased to washing by means of tannin and antimony, but with a dulling of the shade. The dyed and rinsed acetate silk is treated with 2 to 4 per cent of tannic acid for about an hour at 38 deg. Cent. (100 deg. Fahr.), and then, without rinsing, in a cold bath containing 1 to 2 per cent of tartar emetic for thirty minutes. In many cases the fastness may be rendered satisfactory by simply treating the dyed acetate silk in a single bath containing one-half of 1 per cent of tannic acid.

Method No. 116: *Copper Sulphate Treatment of Basic Dyes to Increase the Light Fastness.*—The fastness to light of the basic dyes on acetate silk may in some cases be increased by rinsing the dyed acetate silk and then treating it in a bath containing 2 per cent of copper sulphate and a little acetic acid at 55 to 60 deg. Cent. (130 to 140 deg. Fahr.) for fifteen minutes. The shade is more or less dulled by this treatment.

The Gallocyanine Dyes on Acetate Silk

Method No. 117.—The application of the gallocyanine dyes was covered in Method No. 14, Part III, page 244, and Method No. 28, Part IV, page 281. Modern Violet, Gallocyanine and Modern Heliotrope may also be applied to acetate silk by entering the material into a cold dye bath and gradually raising the temperature. After dyeing, the shades should be soaped and the ultimate shade developed and fixed by after-treatment in a chrome bath as in Method No. 118. Possibly certain other dyes of this class are also applicable by this method.

Method No. 118: *Developing and Fixing the Gallocyanine Dyes on Acetate Silk.*—Enter the dyed and rinsed acetate silk into a fixing bath containing 1 to 2 per cent of bichromate and the same amount of 40 per cent acetic acid. After working for some time, rinse the acetate silk well and dry at a low temperature.

The Setacyl and Setacyl Brilliant Dyes

[Note.—*The author is indebted to C. W. Mahnken, of the Geigy Company, for data upon the application of the Setacyl and Setacyl Brilliant dyes.*]

TABLE NO. XXIII.
APPLYING THE SETACYL AND SETACYL BRILLIANT DYES WITH SETACYL SALT A.

FORMULA NO. AND COLOR; QUANTITY AND NAME OF DYE	WEIGHT OF GELATIN (in grams per liter of dye bath)	—WEIGHT OF SETACYL SALT A— (in grams per liter of dye bath) 1st Addition (After 10 Minutes)	2nd Addition (After Further 15 Minutes)	3rd Addition (After Further 10 Minutes)
* 1—Lemon-Yellow: 2% Setacyl Yellow AO	1.00	0.75	0.75	....
* 2—Orange: 2% Setacyl Yellow AO and 0.3% Setacyl Brilliant Pink G	1.00	0.75	0.75	....
3—Brownish-Orange: 2% Setacyl Orange CR and 1% Setacyl Yellow AO	1.00	0.75	0.75	....
4—Tan-Brown: 1% Setacyl Violet BR and 1% Setacyl Orange CR	1.00	0.75	0.75	....
* 5—Tan-Brown: 2% Setacyl Violet BR and 1% Setacyl Yellow AO	1.00	0.75	0.75	....
6—Tan-Brown: 1% Setacyl Violet BR, 1% Setacyl Orange CR and 0.6% Setacyl Brilliant Pink G	1.00	0.75	0.75	....
* 7—Cerese: 1% Setacyl Red FC	2.00	0.20	0.40	0.40
* 8—Eosine-Pink: 0.3% Setacyl Brilliant Pink G	1.00	0.10	....	....
* 9—Eosine-Pink: 2% Setacyl Brilliant Pink G	1.00	0.75	0.75	....
*10—Scarlet: 4% Setacyl Brilliant Scarlet B	1.00	0.75	0.75	....
*11—Scarlet: 2.5% Setacyl Brilliant Scarlet G	1.00	0.75	0.75	....
*12—Scarlet: 4% Setacyl Brilliant Scarlet R	1.00	0.75	0.75	....
*13—Greenish-Blue: 2% Setacyl Sky Blue S	2.00	0.30	0.30	0.40
*14—Greenish-Blue: 2% Setacyl Turquoise Blue S	2.00	0.30	0.30	0.40
*15—Bluish-Green: 2% Setacyl Green Bluish M	1.00	0.75	0.75	....
*16—Deep Green: 2% Setacyl Green M	1.00	0.50	0.50	0.50
*17—Green: 2% Setacyl Green B	2.00	0.40	0.30	0.30
*18—Grass-Green: 1% Setacyl Green B and 1% Setacyl Yellow AO	1.00	0.50	0.50	0.50
*19—Sea-Green: 0.5% Setacyl Green M and 1.5% Setacyl Yellow AO	1.00	0.50	0.50	....
*20—Greenish-Blue: 0.3% Setacyl Violet BR and 3% Setacyl Green M	1.00	0.50	0.50	....
*21—Bluer Than No. 20: 0.75% Setacyl Violet BR and 2.25% Setacyl Green M	1.50	0.50	0.50	....
*22—Blue: 1.6% Setacyl Violet BR and 2.4% Setacyl Green M	1.50	0.75	0.75	....
*23—Violet-Blue: 1.6% Setacyl Violet BR and 2.4% Setacyl Green Bluish M	1.50	0.75	0.75	....
*24—Dark Violet: 3% Setacyl Violet BR and 1% Setacyl Green Bluish M	1.00	0.75	0.75	....
25—Heliotrope: 1% Setacyl Violet MB	2.00	0.30	0.30	0.40
26—Heliotrope: 1% Setacyl Violet MB and 0.3% Brilliant Pink G	2.00	0.30	0.40	0.30
27—Deep Violet: 2% Setacyl Violet BR	1.00	0.75	0.75	....
28—Good Black: 8% Setacyl Black BN	2.00	0.50	0.75	0.75
29—Good Black: 8% Setacyl Black GN	2.00	0.50	0.75	0.75

The Setacyl and Setacyl Brilliant dyes are entirely different from the Setacyl Direct dyes, which will be discussed under the acid dyes, and are applied in a different manner. Probably this method of dyeing is best classified as "dyeing by precipitation." One of the first patents along this line appears to be British Patent No. 179,381, discussed in Part VIII, page 420, Methods No. 61 and No. 62. This patent was superseded by British Patent No. 213,593. British Patent No. 231,897 is along the same line, and both are discussed later.

From these patents and other available information it would appear that the Setacyl dyes are probably largely members of the basic group, although this may not apply to nearly all of them. For instance, it is possible that Setacyl Yellow AO corresponds to Auramine O; Setacyl Green M may be Methylene Green (Colour Index No. 924), which is the fastest basic green dye; Setoglaucine may possibly correspond to Setacyl Turquoise Blue S, while Setacyl Sky Blue S may be Setocyanine. However, the fact that some of these dyes are members of the older basic group does not necessarily indicate that they do not have different and valuable properties when applied by means of Method No. 119. The depth of shade obtained by this method indicates that at least the exhaustion is entirely different from that of the basic dye alone.

The Setacyl Brilliant dyes appear to be new dyestuffs and as yet nothing definite has been learned regarding their constitution. Judging from the fluorescent properties of the resulting colors, they appear to be related to fluorescein. The beautiful yellowish-pink shade of Setacyl Brilliant Pink G suggests a relationship to Eosine (Colour Index No. 768). While Setacyl Brilliant Scarlet

B, G and R are fluorescent, they do not possess this property to the extent of the pink.

The Setacyl and Setacyl Brilliant dyes are applied to the acetate silk at low temperatures in a bath only slightly acid with acetic acid, and therefore the valuable properties of the acetate silk are not impaired in any way. They give very pure, bright and bloomy shades, and their fastness properties meet the usual requirements. Other fibers present in the dye bath are stained somewhat. In Table No. XXIII, on preceding page, the dyes marked (*) possess a good fastness to light. In order to obtain the desired results it is essential that the dyeing instructions as given in Method No. 119 be followed closely.

Method No. 119: *The Setacyl and Setacyl Brilliant Dyes on Acetate Silk.*—About a thirty-to-one dye bath should be prepared with the necessary quantity of dyestuff, calculated on the weight of the goods, and with gelatin or glue as given in Table No. XXIII, based upon the volume of the dye bath in liters. The dyestuff should be dissolved in acetic acid before adding it to the dye bath, using a volume of acid in cubic centimeters equal to one-half the weight of dye in grams. Enter the previously thoroughly wet-out acetate silk at about 55 deg. Cent. (131 deg. Fahr.) for light and medium shades, or at 65 to 70 deg. Cent. (149 to 158 deg. Fahr.) for dark shades. Dye the goods for about ten minutes; then remove the goods and add the first portion of the Setacyl Salt A, as given in Table No. XXIII. Mix well, re-enter the goods and dye for about fifteen minutes. Add the second portion of the Setacyl Salt A, always in solution, and continue the dyeing. After about ten minutes more the third portion of the Setacyl Salt A may be added, if necessary.

The whole dyeing operation usually requires about one hour for medium shades. Darker shades require a longer time and blacks about two hours. After dyeing, the acetate silk should be rinsed and then soaped for about three minutes in a cold bath containing 2 grams of soap per liter. This soaping is very important, as it improves the fastness to rubbing. After soaping and brightening with formic acid, the material should be dried, without previously rinsing, at a temperature not exceeding 30 to 40 deg. Cent. (86 to 104 deg. Fahr.).

British Patent No. 213,593, March 27, 1924, to J. R. Geigy, very possibly covers Setacyl Salt A and the application of the Setacyl dyes. It states that acetate silk may be dyed by immersion at a temperature of 45 to 50 deg. Cent. (113 to 122 deg. Fahr.) in an aqueous bath containing a dyestuff having little or no affinity for acetate silk, but which is precipitated by the addition of suitable aromatic substances, preferably in the presence of a protective colloid. Alternatively, the acetate silk may be previously treated with a solution of the precipitant, squeezed and immersed in the solution of the dyestuff. Suitable precipitants include the sulphonic acids of benzene, naphthalene and anthraquinone, the salts of these acids and their hydroxy, alkyl, chloro and nitro derivatives. Aromatic carboxylic acids, such as salicylic acid, may also be used as precipitants, and glue or gelatin as the colloid.

Method No. 120: For example, acetate silk may be dyed by immersion in a dye bath containing 2 per cent of Methylene Green and 2 per cent of sodium diphenylaminesulphonate, or 2 per cent of Auramine O and 2 per cent of sodium *o*-cresotate, or 2 per cent of Martin's Yellow, 4 per cent of gelatin and 2 per cent of benzoic acid, in a sixty-to-one dye bath.

British Patent No. 231,897, March 27, 1924, to J. R. Geigy, claims that acetate silk may be printed with a paste containing aromatic sulphonic or carboxylic acids or their substitution products, or a salt of such an acid, and a dye which has only a slight affinity for this fiber. Protective colloids may also be included in the paste. By an alternative method, the acetate silk may be saturated with a solution of one of the acids mentioned, then dried and printed with the dye paste.

Method No. 121: *Printing Acetate Silk.*—For example, one part of 2, 7-naphtholsulphonic acid is dissolved in thirteen parts of warm water and mixed with thirty-six parts of gum thickening. This is mixed with the color paste prepared from one part of Setoglaucine, five parts of 80 per cent acetic acid, ten parts of water and thirty-four parts of gum thickening. The prints are steamed and washed. Other suitable acids are the sulphonic acids of benzene, naphthalene and anthraquinone, salicylic acid, and the hydroxy, alkyl, chloro and nitro derivatives of these acids.

Blue Shades With Napthol AS

A Paper Read Before the Ninth Congress of Chemists and Colorists, at Vienna

By Dr. J. Rath

(*Translated from Textil-Berichte, November,* 1924, *by Carl Toepler*)

THE problem of dyeing Dianisidine on Naphthol AS presents much greater difficulties than the dyeing of red, since the diazo compound of Dianisidine contains two diazo groups which must be coupled. If a skein of Naphthol AS prepared yarn is developed with a diazo solution of Dianisidine, various results are obtained, depending on whether the solution is acid, neutral, or alkaline. In acid solution, comparatively weak greenish-blue shades are obtained; in neutral solution, deep navy blue shades, while the alkaline coupling produces deep reddish blue shades, with partial decomposition of the diazo solution. The fact is that the uncoppered dyeings possess only a moderate fastness to light, and it is therefore necessary to introduce copper in some form into the dyestuff; this presents further difficulties.

In the early days following the discovery of Naphthol AS, the method used consisted in coupling an acid (acetic acid) diazo solution, with the addition of copper salts. Later, it was found that an addition of copper compounds caused a decomposition of the diazo solution, the shades

at first having a greenish cast which gradually became reddish with prolonged use of the dye bath. It was also observed that on the surface of the thick strand of yarn, where the caustic soda of the prepare came in contact with an excess of acid of the developer, lighter shades resulted than in the center of the strand, where the coupling took place more or less neutral or even alkaline. Streaky and uneven dyeings resulted. The idea of introducing copper in the form of Fehling's solution to the prepare bath prevented the decomposition of the developing bath, but did not prevent the streaky appearance of the dyeings. It was also found that the fastness to light of such dyeings was not improved to any greater extent. In all probability, the copper is not in the ionic state, and in the form of Fehling's solution is not able to combine with the dyestuff molecule as ionic copper can.

It is therefore necessary to do away with the weak acid dye bath, but on the other hand, it becomes necessary to protect the neutral dye bath from the alkali of the prepare being carried into it, by the use of some substance which will combine with the alkali, but possesses no acid character. Such a substance was found in a mixture of sodium bicarbonate and zinc bicarbonate. The sodium bicarbonate is converted into the normal carbonate by the alkali of the prepare, and this reacts with the zinc bicarbonate to form zinc carbonate and regenerates the sodium bicarbonate. To facilitate the preparation of the developing baths, a stable diazo salt, containing a zinc compound, known as Fast Blue Salt B, has been placed on the market by the Chemischen Fabriken Griesheim-Elektron and Farben Fabriken vorm. Fried. Bayer & Co. It is only necessary to add an excess of sodium bicarbonate to a solution of this salt to obtain a satisfactory dye bath. To obtain dyeings of good fastness to light it is necessary to introduce the copper by after-treatment with copper sulphate and acetic acid or with a solution of 3 grams per liter of copper acetate. The dyeings made in the above manner are distinguished by their uniform, deep shade. Even with a prepare of 3 grams Naphthol AS-BO per liter, deep navy shades are obtained.

The numerous scientific and practical investigations toward the solving of the Naphthol AS-Blue problem were carried out by the author's collaborators, Messrs. Schaefer and Jellinek.

WATCH FOR THE STAIN TO RETURN

Have you ever had the experience of using a stain remover with apparent success and having the stain return to a considerable degree later on? This condition occurs frequently when using reducing or "de-oxidizing" materials as stain removers.

The action is comparatively simple. The original reaction which takes place when the stain remover is applied is one of reducing or extracting oxygen from the impurity forming the stain. The extracting of the oxygen removes the color or causes it to be changed; but does not remove the foreign matter which originally caused the stain. When the reducing agent is rinsed out and the fabric dried, the oxygen present in the air exhibits enough chemical affinity for the matter left in the fabric to reoxidize it and partially return the color.

This is no attempt to belittle or discourage the use of reducing stain removers. However, when using them, the laundry owner should be careful not to return the garment as clear of stain until the action described above has had a chance to take place. An ounce of prevention is worth a pound of cure.

PRINTING WITH LIQUID ARTIFICIAL SILK

The latest novelty in connection with the utilization of artificial silk in the textile industry is in combinations which have been made between artificial silk and cotton material, the former being used in the liquid state for decorating the cotton by means of fabric printing rollers and adding the artificial silk as an ordinary liquid color and simply printing it onto the cotton fabric. The rollers have, of course, a design already on them, and by means of the liquid cellulose solution this design is carried on to the cotton goods. The Lancashire correspondent of Fairchild's Journal draws attention to this new process in the current number, and states that those parts of the fabric which are covered by the solution take upon themselves a translucent appearance when held to the light, something after the style of an oil marking on paper. Viewed from a distance, the pattern has the appearance of a woven design, though, of course, some designs while looking as if woven yet reach far beyond the possibilities of this form of ornament in the matter of delicacy and intricacy. Diagonals, minute dots, and leathery scroll work are produced with the utmost accuracy, either singly or in combination. "The manner of the design can, of course, be reversed, so that instead of the design being formed of cellulose and taking on a lighter appearance than the surrounding ground, the pattern can be left blank while the ground is coated and becomes translucent."

Further, wherever the liquid cellulose falls on the cotton, that part becomes 20 per cent stronger, and while the cloth must be mercerized the handle or draping qualities of the material are preserved, and the finish is said to be permanent and to remain unaffected by laundering. The excellent and novel effects are furthermore produceable at a fraction of a penny a yard where big quantities are being dealt with. It is unnecessary to point out the great interest which will doubtless be evoked in this new production and the far-reaching nature of the utility of the development in the production of many varied types of designs on many kinds of materials.—Yorkshire Evening Argus.

The New York Color & Chemical Company, Inc., has filed a certificate in the office of the New York Secretary of State decreasing its capital stock from $350,000 to $10,000.

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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Lowell Textile School, Lowell, Mass.

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A. K. Johnson, Secretary, Lowell Textile School, Lowell, Mass.

Rhode Island Section—
Walter S. Williams, Chairman, Mount Hope Finishing Co., North Dighton, Mass
Albro N. Dana, Secretary, Franklin Process Co., Providence, R. I

New York Section—
Herbert Grandage, Chairman, Clark Thread Company, Newark, N. J.
Daniel P. Knowland, Secretary, Geigy Co., 89 Barclay Street, New York City.

Philadelphia Section—
Elmer C. Bertolet, Chairman, Philadelphia Textile School, Philadelphia, Pa.
Percival Theel, Secretary, Philadelphia Textile School, Philadelphia, Pa.

Southern Section—
Leonard Little, Chairman, Pacific Mills, Lyman, S. C.
Harry W. Ormand, Secretary, Union Bleachery, Greenville, S. C.

THIRTY-FOURTH COUNCIL MEETING

The thirty-fourth meeting of the Council of the American Association of Textile Chemists and Colorists was held on Friday, October 30, 1925, at the Engineer's Club, Boston, Mass.

The following members were in attendance: Prof. L. A. Olney, W. C. Durfee, G. A. Moran, J. F. Bannan, W. R. Moorhouse, W. S. Williams and W. E. Hadley; and in addition the following members of the Research Committee or Special Committees: W. H. Cady, A. A. Claflin and A. E. Sampson.

Letters of regret at being unable to attend were received from H. Christison, P. J. Wood, E. H. Killheffer, W. D. Livermore, R. F. Culver and W. M. Scott.

The following applicants were admitted to membership in the Association:

Active

Benzing, Ernest H., colorist, National Aniline & Chemical Company, New York, N. Y. 968 Gillies Avenue, North Bergen, N. J.

Curtis, Francis J., technical adviser, sales department, Merrimac Chemical Company, Boston, Mass.

Edwards, W. F., chemist, United States Testing Company, Inc., New York, N. Y. 340 Hudson Street, New York City, N. Y.

Gallagher, H. A., dyer, Maumee Finishing Company, Toledo, Ohio.

Hewitt, Frank C., chemist, Merrimack Manufacturing Company. 126 Grove Street, Lowell, Mass.

Ivey, W. R., laboratory manager, E. I. du Pont de Nemours, 232 W. First Street, Charlotte, N. C.

Lesser, E., chemist, American Dyewood Company, 72 Gold Street, New York, N. Y.

Micheles, Leo M., dyehouse chemist, Robinson Rayon Company. 50 W. Sixty-ninth Street, New York, N. Y.

Smith, T. R., overseer of dyeing and mercerizing, Crystal Springs Bleachery Company. Box 202, Chickamauga, Ga.

Junior

Everist, T. B., chemist, Cold Spring Bleachery, Yardley, Pa.

Thompson, Ed. F., assistant dyer, Peerless Plush Manufacturing Company, Summer and Franklin Street, Paterson, N. J.

The request of the Southern Section, seeking approval for the subdivision of the Southern Section, owing to the large territory covered by its members, was considered by the Council. Dr. E. H. Killheffer, Special Council representative, who attended the recent meeting of the Southern Section, reports that a sufficient number of Southern members were not at present available in the locality desired, to meet the terms of the Constitution, and the formation of a second Southern Section has therefore been deferred to a later date.

The following resignations were accepted: R. O. Fernandez, F. H. Prevost, Sherman Y. Alexander, Giles Low, Hugh O. Luckman.

Much of the work of the Council was given over to

the consideration of the Annual Meeting which is to be held in Boston on December 4 and 5, 1925. The following plans for the program are quite complete at the present time, and we feel assured that the program will be carried out in the order listed below:

Friday Morning—

Trips to points of interest.

Friday Afternoon—

2:00 P. M.—Council meeting.

3:00 P. M.—Research Committee meeting.

Friday Evening—

6:00 P. M.—Buffet Lunch.

7:00-9:00 P. M.—Smoker and Open Forum.

9:00 P. M.—Entertainment and Social Hour.

Saturday Morning—

9:30 A. M.—Annual Business Meeting.

The following papers will be presented:

Contributions of Work Conducted Under the Auspices of the Research Committee

Action of Alkalies on Wool. Importance of pH—H. C. Chapin.

Analytical Study of Weight Losses of Artificial Silk, with Alkalies—A. K. Johnson.

Study of Hygroscopic Nature of Artificial Silk, Moisture Content, and Regains—A. K. Johnson.

Hydrogen Ion Concentration—W. M. Scott.

Suggestions for a Simple Standard for Testing the Fastness of Dyed Materials to Light—W. F. Deady.

A New Lamp for Fading Textiles—W. D. Appel.

Waterproofing Textile Fabrics—H. Pearson.

Saturday Afternoon, December 5th—

Walker Memorial, Massachusetts Institute of Technology, Cambridge, Mass.

Dyeing of Acetate Silk—W. R. Davies.

The Application of Vat Dyes to Rayon—Floyd Warshaw.

Development in the Naphthol AS Series, and the Rapid Fast Colors—H. E. Hagar and W. R. Marsson.

Oiling of Cotton Preliminary to Spinning—Everett H. Hinckley.

Various Phases of the Cotton Oiling Process and Its Relation to Finishing—Richard B. Earle.

The Dyeing of Viscose Rayon with Mordant Dyes—W. C Durfee.

The Dyeing of Silk White Effects Upon Woolens and Worsteds—Alan A. Claflin.

Saturday Evening, December 5th—

6:30 P. M.—Banquet. Walker Memorial.

The following have been suggested as possible subjects for the Open Forum to be held on Friday evening, December 4, but it is hoped that other subjects will be introduced by interested members:

In What Way Can the Association be of Greatest Value to the Members, to Textile Manufacturers and to the Dye-Producing and Distributing Agencies.

The Cause of the Scratching of Copper Rolls During the Printing Process.

In What Way Can the Association Best Cooperate with the Textile Educational Agencies of the Country.

Modern Application of Liquid Chlorine in Bleaching.

The Advantages of Bleaching Assistants Used in Kier Boil.

Old and New Methods in the Printing of Textile Fabrics.

Relative Merits of Open and Closed Systems for Coloring of Loose Wool.

Lime Boil versus Caustic Boil.

Respectfully submitted,
W. E. Hadley, Secretary.

OCTOBER MEETING OF THE PHILADELPHIA SECTION

The regular October meeting of the Philadelphia Section of the American Association of Textile Chemists and Colorists was held in the Auditorium of the Philadelphia Textile School in Philadelphia, Friday evening, October 23, 1925.

The meeting proper was preceded as usual by the informal dinner held at the City Club of Philadelphia, at which fourteen were present.

The meeting was called to order by the Chairman, Mr. Bertolet, at 8.30 P. M., in the auditorium of the Philadelphia Textile School.

The minutes of the previous meeting held in April, 1925, were read and approved as read.

There being no reports of Officers, Executive Committee or other standing committees, Mr. Bertolet appointed Messrs. Mullin and Archer to serve as a nominating committee to nominate officers and executive committee for the section for the coming year and to report at the next meeting.

By motion duly seconded and passed it was decided to hold a meeting in November.

There being no further business Mr. Bertolet then introduced Mr. Moffit, of the Kuttroff & Pickhardt Company, who gave a very interesting talk and demonstration of the properties of Nekal. After a brief discussion on this subject, Mr. Bertolet gave a very interesting account of his trip to Europe, taking on his subject the textile schools which he visited while abroad.

On motion by Dr. Hollander a rising vote of thanks

was tendered the speakers of the evening and the meeting adjourned at ten P. M.

There were thirty-seven present.

PERCIVAL THEEL, Secretary.

NOVEMBER MEETING OF THE PHILADELPHIA SECTION

The regular November meeting of the Philadelphia Section of the American Association of Textile Chemists and Colorists was held in Philadelphia on Friday, November 13, 1925.

The meeting was preceded as usual by an informal dinner at 313 S. Broad Street at which thirteen members were present.

The meeting proper was called to order by the chairman, Mr. Bertolet, in the Auditorium of the Philadelphia Textile School, at 8.30 P. M.

Following the usual order of business, the minutes of the previous meeting were read and approved as read. There being no report of officers or Sectional Committee, Mr. Mullin, of the Nominating Committee, appointed at the last meeting, made the following report of nominees: For Chairman, Carl E. Medde; Treasurer, John H. Hennessey; Secretary, Percival Theel; Sectional Committee, Messrs. L. A. Stead, R. A. MacIntyre, Chas. S. Hollander and E. C. Bertolet.

Following discussion, a motion was made and passed that the annual meeting of the section in December be a social meeting and that arrangements be made accordingly.

The date of the Annual Meeting of the Association in December in Boston was announced, and it was proposed that those who were going to Boston go as a party on the same train.

There being no further business to come before the Section Mr. Bertolet then introduced our former chairman, Dr. R. E. Rose, of the E. I. du Pont de Nemours & Co., who gave a most interesting and instructive talk on "The Interplay of Art and Science in the Development of a Dye." This lecture was profusely illustrated with slides showing the formulae and dyed with the particular dye in discussion.

Following a motion for a rising vote of thanks to the speaker of the evening, which was duly passed, the meeting adjourned at 10.15 P. M. There were forty-five present.

PERCIVAL THEEL, Secretary.

NOVEMBER MEETING OF THE RHODE ISLAND SECTION

The November meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists was held on Wednesday evening, November 18, at 8 P. M., in the rooms of the Providence Engineering Society. Walter S. Williams, Chairman of the Section, presided.

Plans for the joint meeting with the American Chemical Society on December 1 were discussed, and opinion favored a buffet supper to precede the joint meeting.

The speaker of the evening was Prof. R. P. Russell of the School of Chemical Engineering Practice at the Massachusetts Institute of Technology. The subject of his speech was "Elimination of Red Water or the Use of Silicate of Soda as a Rust Preventive."

A series of slides illustrated the very interesting address. Prof. Russell was exceptionally well qualified to discuss this subject, which was of great interest to all textile chemists and colorists. A resume of Prof. Russell's remarks will be published in the near future.

Although the meeting was held on a Wednesday evening, instead of the customary Friday evening, over forty members were present.

Respectfully submitted,

A. N. DANA, Secretary.

NOVEMBER MEETING OF THE NEW YORK SECTION

The November meeting of the New York Section was held Friday evening, November 20, at the Machinery Club, New York City. The usual informal dinner preceded the meeting proper, the general subject of which was "Vat Colors." One hundred and ten members and guests were in attendance.

The speakers of the evening were M. E. Tice, of the Dutchess Bleachery, Wappinger Falls, N. Y., whose subject was "Dyeing Cotton Piece Goods with Vat Colors"; Jean Kern, of E. I. du Pont de Nemours & Co., Wilmington, Del., whose paper, entitled "Printing with Vat Colors," and C. A. Seibert, of the General Dyestuff Corporation, New York City, who spoke on "Vat Colors for Wool." There was also a general discussion of the subject of "Vat Colors for Silk." All of these papers and the discussion following same will be published in full in the near future.

A resolution was passed directing the Secretary to extend a formal invitation to the Council to hold the Annual Meeting for 1926 in New York City.

D. P. KNOWLAND, Secretary.

Applicants for Membership

Active Membership

Caffrey, Raymond E., overseer of dyeing, Pacific Mills Print Works, Lawrence, Mass. Sponsors: J. F. Warner and Geo. A. Moran.

Jackson, Lloyd, research chemist, Mundatechemical Society of America, Mellon Institute, Pittsburgh, Pa. Sponsors: Chas. F. Goldthwait and Geo. H. Johnson.

Knoll, George K., colorist, J. H. and C. K. Eagles, Shamokin, Pa. Sponsors: John Pfromm and E. H. Aeckerle.

Lovit, Isaac, chemist, 159 Jencks Street, Fall River, Mass. Sponsors: A. D. Nute and A. E. Hirst.

MacDonald, Hector G., chemist, Franklin Process Company, Providence, R. I. Sponsors: W. H. Wingate and W. A. Travers.

McDowell, Jos. C., superintendent of U. S. bleachery, Ware Shoals Bleachery, Ware Shoals, S. C. Sponsors: Chas. H. Stone and J. E. Moore.

Maupie, E. L., president, Maupai Dyeing Company, Inc., New York City, N. Y. Sponsors: D. P. Knowland and A. Ellsmann.

Scott, H. M., chief chemist, Robert Clay, Ltd., Cheadle, Cheshire, England. Sponsors: P. F. Estey and J. A. Pawson.

Smith, H. D. W., textile engineer and chemist, Wellington, Sears & Co., New York City, N. Y. Sponsors: P. J. Hassett and J. J. Sokolinski.

Talbot, Joseph L., cotton dyer, Pacific Print Works, Lawrence, Mass. Sponsors: J. F. Warner and Wm. H. Cady.

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Sayers, William J., chemist, Apponaug Company, Apponaug, R. I. Sponsors: R. K. Lyons and Henri F. Schaeffer.

Changes of Address

Adams, Carlton C., 27 Third Street, Haverstraw, N. Y

Cohen, Raphael, 1480 Shakespeare Avenue, Bronx, New York City.

Lehman, F. X., Chemical Company of America, Springfield, N. J.

Lilley, S. Clark, 2662 Whitney Avenue, Hamden, Conn.

Morrill, Elliott, 1229 E. Knox Street, Galesburg, Ill.

Schroeder, Harold, 1010 Massachusetts Avenue, Cambridge, Mass.

Trimble, Warren W., 144 Winthrop Avenue, Lowell, Mass.

Come to Boston

December 4 and 5

YOU will undoubtedly find a number of items on the program of the *Fifth Annual Meeting* that will make your attendance well worth while. It is fully expected to be the largest, most interesting and comprehensive meeting ever held

Take special note of the features on the program, which you will find included in the report of the Council Meeting on page 794.

Then decide to be "among those present."

Foreign Dyes Imported Through New York and Other Ports During October

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce in Collaboration with the Chemical Division of the United States Tariff Commission

KEY TO ABBREVIATIONS OF MANUFACTURERS' NAMES

1—THE SIX LEADING GERMAN COMPANIES

A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873.
B—Badische Anilin-und-Soda-Fabrik, Ludwigshafen-on-the-Rhine. Founded 1865.
By—Farbenfabriken, vormals Friedr. Bayer & Co., Leverkusen-on-the-Rhine. Founded 1862.
C—Leopold Cassella & Co., Frankfort-on-the-Main. Founded 1870.
K—Kalle & Co., A. G., Biebrich-on-the-Rhine. Founded 1870.
M—Farbwerke, vormals Meister Lucius & Bruning, Hochst-on-the Main. Founded 1862.

2—THE SMALLER GERMAN COMPANIES

BK—Leipziger Anilinfabrik Boyer & Kegel, Furstenberg, near Leipzig. Founded 1882.
CG—Chemikaliewerk Griesheim G. m. b. H., Griesheim-on-the-Main. Founded 1882.
CJ—Carl Jager G. m. b. H., Anilinfarbenfabrik, Dusseldorf. Founded 1823
GrE—Chemische Fabrik Griesheim-Electron, Offenbach-on-the-Main. Founded 1842.
L—Farbwerk Mulheim, vormals A. Leonhardt & Co., Mulheim-on-the-Main. Founded 1879
tM—Chemische Fabriken, vormals Weiler ter Meer, Uerdingen-on-the-Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—SWISS COMPANIES (ALL AT BASEL)

DH—Farbwerke vormals L. Durand, Huguenin & Co. Founded 1871.
G—Anilinfarben-und Extract-Fabriken, vormals Joh. Rud. Geigy. Founded 1764.
I—Gesellschaft fur chemische Industrie. Founded 1885.
S—Chemische Fabrik, vormals Sandoz & Co. Founded 1887

4—DUTCH AND FRENCH COMPANIES

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888
NF—Niederlandische Farben-und-Chemikalienfabrik Delft, Delft, Netherlands. Founded 1897.
CN—Compagnie Nationale de Matieres Colorantes et Produits Chimiques. Founded 1917. (Etablissements Kuhlmann merged with this company in 1923.)
P—Societe Anonyme des Matieres Colorantes et Produits Chimiques St. Denis (formerly A. Poirrier). Founded 1830.

5—ENGLISH COMPANIES

Bro—Brotherton & Co., Ltd., City Chambers, Leeds.
BAC—British Alizarine Co., Ltd., Manchester
BD—British Dyestuffs Corporation, Ltd., London.
Cl Co.—The Clayton Aniline Co., Ltd., Clayton, Manchester.
CV—The Colne Vale Dye & Chemical Co., Ltd., Milnsbridge, Huddersfield.
Hol—L. B. Holliday & Co., Ltd., Huddersfield.
Scot—Scottish Dyes, Ltd., Grangemouth.

FOREIGN dyes imported through New York and other ports during the month of October totaled 366,121 pounds, valued at $339,218, an increase over imports of the previous two months. The imports by ports were as follows: New York, 324,769 pounds, with an invoice value of $295,166; Albany, 32,619 pounds, with an invoice value of $37,419; Boston, 8,147 pounds, with an invoice value of $6,138; Philadelphia, 566 pounds, with an invoice value of $477, and Chicago, 20 pounds, valued at $18. Germany supplied 72 per cent of the October imports and Switzerland 10 per cent, as compared with 62 per cent for Germany for the previous month and 21 per cent for Switzerland.

Imports of Synthetic Dyes

1925—	Pounds	Invoice Value
January	403,984	$359,376
February	373,259	365,268
March	527,964	488,501
April	451,005	426,141
May	370,271	347,904
June	376,668	333,654
July	675,843	692,615
August	330,674	303,612
September	298,858	285,642
October	366,121	339,218
Supplementary*	171,191	132,248
Total, ten months	4,345,838	$4,074,179

*Includes items not heretofore reported for the period of January to September, 1925, through the port of New York.

Imports of coal-tar dyes in October are reported as follows by the Department of Commerce:

	Pounds	Invoice Value
New York	324,769	$295,166
Albany	32,619	37,419
Poston	8,147	6,138
Philadelphia	566	477
Chicago	20	18
Total	366,121	$339,218

Five Leading Dyes, by Quantity, Imported During October

	Pounds
Rhodamine B Extra (single strength)	19,880
Indanthrene Blue GCD (single strength)	19,832

Brilliant Indigo 4B (single strength)	10,270
Rhodamine 6G Extra (single strength)	10,000
Indanthrene Blue G (single strength)	8,871

Dyes and Intermediates Remaining in Bonded Customs Warehouse

	Coal-Tar Dyes and Colors (pounds)	Coal-Tar Intermediates (pounds)
January 31, 1925	571,371	952,202
February 28, 1925	566,038	961,406
March 31, 1925	653,020	1,050,539
April 30, 1925	668,365	1,048,334
May 31, 1925	734,705	1,087,745
June 30, 1925	825,528	1,171,383
July 31, 1925	775,916	1,378,837
August 31, 1925	767,431	1,363,760
September 30, 1925	709,381	1,359,717

The dyes in this report are grouped by both Colour Index and Schultz numbers, and in the case of those which could not be identified by either number the classification according to the ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced—in nearly every case—to a single-strength basis.

DYES OF COAL-TAR ORIGIN*

Colour Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
32	182	Brilliant Sulphon Red 5B—(S)	
		Brilliant Sulphon Red 10B—(S)	1,300
44	56	Nitrosamine Red Paste—(B)	700
54	64	Sorrel Red X—(B)	500
80	83	Ponceau 3R—(AG)	5
225	194	Thiazine Red RXX—(B)	300
249	224	Diamine Orange F—(C)	300
259	233	Cloth Red B—(By)	3
278	—	Fast Cotton Red 8BL—(AG)	500
288	257	Sulphon Cyanine G—(By)	529
316	273	Diaminogene Blue NA—(C)	311
319	—	Chlorazol Fast Helio BK—(BD)	
		Benzo Fast Heliotrope BL—(By)	
		Benzo Fast Heliotrope 2RL—(By)	1,958
324	—	Diazo Brilliant Scarlet ROA—(By)	
		Diazo Brilliant Orange GR—(By)	883
325	—	Brilliant Benzo Violet B Powder—(By)	
		Diamine Brilliant Violet B—(C)	
		Diamine Fast Violet FFBN—(C)	
		Naphthamine Light Violet 2B—(K)	3,101
326	279	Benzo Fast Orange WS—(By)	
		Benzo Fast Scarlet GS—(By)	210
382	319	Chloramine Red 3B—(S)	
		Diamine Scarlet 3B—(C)	1,757
388	—	Chlorazol Violet R—(BD)	500
409	339	Diamine Orange B—(C)	1,725
436	358	Chloramine Red 8BS—(By)	
		Chlorantine Red 8BN—(I)	2,006
440	360	Ignamine Orange R—(B)	470
449	364	Diazo Brilliant Black B—(By)	498
459	373	Congo Orange R—(AG)	500
466	380	Benzo New Blue 5B—(By)	3
471	385	Minaxo Blue 4R—(B)	100
487	400	Milling Scarlet 4R Conc.—(M)	200
535	435	Brown JB (Janus Brown B)—(M)	25
636	19	Fast Light Yellow 2G—(By)	
		Fast Light Yellow 3G—(By)	3,745
652	29	Eriochrome Red B—(G)	2,755
667	503	Brilliant Acid Green 6B—(By)	
		Guinea Fast Green 3B—(AG)	
		Poseidon Green SGX—(B)	1,450
670	505	Fast Light Green SFX—(By)	637
671	506	Erioglaucine AP—(G)	5,836
677	512	Magenta AB Powder—(B)	100
681	516	Crystal Violet Extra Powder—(B)	1,000
682	518	Ethyl Violet—(B)	500
692	524	Magenta S—(B)	100
707	539	Opal Blue, Blue Shade—(M)	200
712	543	Patent Blue V—(M)	
		Poseidon Blue BGX Conc.—(B)	1,309
714	545	Brilliant Acid Blue A—(By)	
		Patent Blue A—(M)	
		Poseidon Blue BR Extra—(B)	3,270
715	546	Cyanol Extra—(C)	
		Cyanol FF—(C)	2,598
718	549	Brilliant Chrome Violet 4B—(DH)	220
720	551	Brilliant Blue G Powder—(By)	
		Chromoxane Brilliant Blue G—(By)	775
729	559	Victoria Pure Blue BO—(B)	100
733	562	Fast Acid Blue B—(By)	
		Intensive Blue B—(By)	275
748	579	Sulpho Rosazeine B Extra—(M)	100
749	573	Rhodamine B Extra (s. s.)—(B)	
		Rhodamine B Extra Base—(B)	
		Rosazeine B Extra—(M)	19,880
752	571	Rosazeine 6G Extra (s. s.)—(M)	
		Rosazeine 6GD Extra—(M)	10,000
757	580	Fast Acid Violet B—(M)	200
768	587	Eosine A—(B)	
		Eosine Y—(CJ)	356
773	592	Erythrosine—(M)	
		Erythrosine—(Q)	60
787	—	Coriphosphine OX Extra—(By)	441
788	603	Acridine Orange DHE—(DH)	
		Brilliant Acridine Orange A—(DH)	2,644
793	606	Phosphine 3R—(AG)	4,000
797	608	Patent Phosphine GRNTN—(B)	
		Patent Phosphine RRDX—(B)	1,700
802	—	Quinoline Yellow KT Extra—(B)	500
815	618	Thioflavine TCN—(C)	55
828	672	Azo carmine G Extra—(B)	
		Azo Carmine GX—(B)	1,030
833	—	Wool Fast Blue BL—(By)	
		Wool Fast Blue GL—(By)	
		Xylene Milling Blue AE Conc.—(S)	1,691
865	700	Nigrosine T—(B)	
		Silver Gray P—(AG)	275
875	923	Fouramine A, AN, AT—(P)	
		Fur Blue Black A—(AG)	
		Fur Brown P, SP, 4R—(AG)	
		Nako SB—(M)	518
876	620	Capri Blue GON—(L)	50
677	621	Brilliant Cresyl Blue 2BS—(L)	50
878	622	Brilliant Delphine Blue B—(S)	1,000
879	—	Chromazurine E Powder—(DH)	220

*This table includes imports through the port of New York to the amount of 324,769 pounds, and also 32,619 pounds through the port of Albany, 8,147 pounds through the port of Boston, 556 pounds through the port of Philadelphia and 20 pounds through the port of Chicago.

Colour Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
884	627	Chromacetine Blue S Extra—(DH)	
		Modern Royal Blue Powder—(DH)	881
892	635	Modern Violet Powder—(DH)	882
905	645	Gallazine No. 90 Powder—(DH)	441
924	660	Methyiene Green G Extra Conc.—(S)	100
926	661	Thionine Blue GO Old—(M)	1,000
1027	778	Alizarine VI Extra Pure—(B)	6,285
1033	779	Alizarine Orange R Paste—(M)	1,000
1034	780	Alizarine Red S Powder—(B)	
		Alizarine Red S Powder—(BD)	
		Alizarine Red W Powder—(By)	1,903
1040	784	Alizarine Red SX Paste—(B)	4,190
1051	799	Alizarine Cyanine GG—(By)	485
1053	—	Alizarine Light Blue SE Conc.—(S)	1,000
1054	858	Alizarine Light Blue B Conc.—(S)	
		Alizarine Sapphire Blue B—(I)	1,806
1060	801	Anthracene Blue SWGG Extra—(B)	140
1067	804	Alizarine Blue S Powder—(B)	
		Alizarine Blue S Powder—(By)	1,187
1071	808	Alizarine Green S Paste—(B)	441
1073	852	Alizarine Blue JR Powder—(By)	
		Alizarine Direct Violet ER—(B)	
		Alizarine Irisol R Powder—(By)	837
1075	856	Alizarine Astrol B Powder—(By)	
		Alizarine Blue AS Powder—(By)	1,466
1076	859	Alizarine Direct Blue RXO Powder—(B)	
		Alizarine Light Blue R—(S)	1,236
1077	860	Alizarine Direct Blue BGACO—(B)	
		Alizarine Light Blue BGAOO—(S)	2,000
1080	853	Anthraquinone Violet Powder—(B)	795
1081	864	Anthraquinone Green GXNO—(B)	214
1082	863	Anthraquinone Blue Green BXO Pdr.—(B)	100
1085	862	Alizarine Blue Black B Powder—(By)	
		Alizarine Blue Black B Powder—(M)	
		Alizarine Blue Black 3B Powder—(By)	5,383
1087	851	Alizarine Leveling Blue B—(C)	1,000
1088	855	Alizarine Sky Blue B Powder—(By)	3,958
1095	759	Anthraflavone GC Paste—(B)	
		Anthra Yellow GC Paste Fine—(B)	
		Helindone Yellow AGC Paste—(M)	
		Vat Yellow GC Paste—(B)	5,305
1097	761	Helindone Golden Orange IRRF Pst.—(M)	
		Vata Orange RRT Paste Fine—(B)	
		Vat Orange RRT Powder (s. s.)—(B)	6,596
1099	763	Vat Dark Blue BOA Paste Fine—(B)	7,261
1102	765	Vat Black BB Dbl. Pst. (s. s.)—(B)	
		Vat Black BB Dbl. Pst. Fine (s. s.)—(B)	176
1103	766	Vat Violet B Extraa Paste—(B)	
		Vat Violet R Ex. Paste Fine—(B)	88
1104	767	Vat Violet RR Ex. Dbl. Pst. (s. s.)—(B)	
		Vat Brilliant Violet RR Pdr. (s. s.)—(B)	2,672
1105	768	Vat Violet B Paste—(B)	44
1106	838	Vat Blue RSP Triple Powder—(B)	900
1109	840	Vat Blue 3G Paste—(B)	1,417
1110	841	Vat Blue GGSNP Quintuple Pdr. (s.s.)—(B)	16
1111	844	Vat Blue 3GP Paste—(By)	
		Vat Blue 5G Powder (s. s.)—(By)	4,481
1113	842	Helindone Blue IGCD Dbl. Pst. (s. s.)—(M)	
		Helin. Blue IGCD Dbl. Pst. Fine (s.s.)—(M)	
		Helindone Blue IGCD Pdr. (s. s.)—(M)	
		Vat Blue GCD Dbl. Pst. (s. s.)—(B)	
		Vat Blue GCD Dbl. Pst. Fine (s. s.)—(B)	
		Vat Blue GCDN Pdr. (s. s.)—(B)	19,832
1114	—	Helindone Blue 1BCS Powder (s. s.)—(M)	
		Vat Blue BCS Powder (s. s.)—(B)	5,000
1115	843	Cibanone Blue G Powder—(I)	110
1118	849	Helindone Yellow IG Dbl. Pst. (s. s.)—(M)	
		Vat Yellow G Dbl. Pst. (s. s.)—(B)	6,912
1123	848	Anthra Gray G Dbl. Pst. (s. s.)—(B)	200
1133	819	Algol Red FF Extra Paste—(By)	800
1135	820	Grelanone Violet BR Paste—(AG)	
		Vat Brilliant Violoet RK Paste—(By)	621
1136	822	Vat Orange RRK Powder (s. s.)—(B)	320
1142	830	Anthra Red R Powder (s. s.)—(B)	
		Anthra Red RT Paste—(B)	778
1145	834	Vat Gray GK Powder (s. s.)—(By)	
		Vat Gray K Powder (s. s.)—(By)	520
1149	873	Helindone Brown IGR Paste—(M)	
		Vat Brown GR Powder (s. s.)—(B)	216
1151	—	Helindone Brown IR Paste—(M)	1,000
1152	—	Vat Brown G Paste—(By)	
		Vat Brown G Powder (s. s.)—(By)	8,871
1155	825	Algol Red B Paste—(By)	400
1161	871	Vat Red Violet RRK Powder (s. s.)—(B)	800
1162	831	Helindone Red IRK Paste—(M)	500
1163	832	Helindone Violet IBN Paste—(M)	
		Vat Violet BN Extra Paste—(B)	
		Vat Violet BN Powder (s. s.)—(B)	830
1177	874	Indigo—(Q)	912
1184	881	Brilliant Indigo 4B Paste—(B)	
		Brilliant Indigo 4B Powder (s. s.)—(B)	10,270
1190	885	Brilliant Indigo B Paste—(B)	2,467
1199	892	Helindone Green G Paste—(M)	300
1208	919	Ciba Bordeaux B Powder (s. s.)—(I)	5,510
1211	910	Anthra Pink AN Paste—(B)	
		Helindone Pink AN Pdr. (s. s.)—(M)	
		Helindone Pink BN Paste—(M)	
		Thioindigo BN Extra Paste—(K)	2,001
1212	918	Ciba Red 3B Powder (s. s.)—(I)	
		Helindone Reddish Violet IRH Paste—(M)	
		Vat Red Violet RH Powder (s. s.)—(B)	
		Vat Red Violet RH Poowder (s. s.)—(B)	
		Thioindigo Red 3B Paste—(K)	8,504
1213	921	Vat Gray 6B Paste—(B)	1
1217	913	Helindone Orange R Powder (s. s.)—(M)	1,000
1219	920	Helindone Violet BB Powder (s. s.)—(M)	
		Thioindigo Violet 2B Powder (s. s.)—(K)	1,110
1222	901	Anthra Violet B Paste—(B)	2
1223	902	Helindone Brown 2R Powder (s. s.)—(M)	560
1227	904	Thioindigo Brown G Paste—(K)	1,000
1228	907	Anthra Scarlet GG Paste—(B)	
		Helindone Fast Scarlet C Paste—(M)	
		Thioindigo Scarlet 2G Paste—(K)	6,935

UNIDENTIFIED DYES

Acid Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Blue RBF—(I)	661
Acid Rhodamine B Extra—(B)	200
Acid Rhodamine BG—(B)	300
Alizarine Direct Blue A2G—(M)	100
Alizarine Direct Blue A3G—(M)	10
Alizarine Direct Red BB—(Q)	10
Alizarine Fast Gray 2BL—(By)	1,744
Azo Rubinol 3GS Conc.—(S)	1,000
Azo Wool Violet 7R—(C)	2,000
Brilliant Acid Blue FF—(By)	1,015
Brilliant Milling Blue B—(C)	1,000
Brilliant Milling Blue FG—(C)	500
Brilliant Scarlet N—(B)	500
Brilliant Wool Blue FFR—(By)	1,488
Cashmere Black TN—(By)	300

Name of Dye and Manufacturer	Quantity (pounds)
Guinea Blue A—(A-G)	500
Guinea Light Blue A—(A-G)	1,000
Indocyanine B—(A-G)	1,796
Kiton Pure Blue V—(I)	1,102
Milling Orange G—(A-G)	100
Milling Red 6B—(A-G)	100
Neolan Red R—(I)	441
Silk Blue BSIC Powder—(A-G)	200
Soluble Blue T—(B)	200
Sulphon Orange G—(By)	286
Supramine Blue FB—(By)	200
Supramine Yellow R—(By)	197
Xylene Milling Blue BL Conc.—(S)	154

Vat Dyes

Alizarine Indigo Brown B Paste—(By)	2,738
Anthra Brilliant Green 5G Paste—(B)	220
Anthra Pink B Extra Paste—(B)	2
Anthra Pink B Extra Paste—(B)	1,046
Anthra Scarlet G Paste—(B)	1,000
Anthra Violet BB Paste—(B)	1
Grelanone Red BB Paste—(A-G)	500
Helindone Brown IRT Paste—(M)	3,000
Helindone Pink R Extra Paste—(M)	2,000
Helindone Printing Black RD—(M)	8,000
Helindone Violet BH Powder (s. s.)—(M)	25
Hydron Brown G Paste—(C)	
Hydron Brown G Powder (s. s.)—(C)	
Hydron Brown R Paste—(C)	3,760
Hydron Sky Blue FK Paste—(C)	882
Hydron Yellow Brown G Paste—(C)	550
Vat Black BGA Double Paste (s. s.)—(B)	88
Vat Blue Green B Double Paste Fine (s. s.)—(B)	984
Vat Brilliant Blue R Powder—(s. s.)—(B)	800
Vat Brown GG Paste—(B)	
Vat Brown IGG Paste—(M)	
Helindone Brown IGG Paste—(M)	1,437
Vat Golden Orange GL Double Paste (s. s.—(B)	88
Vat Golden Orange 3G Paste—(By)	800
Vat Gray RRH Paste Fine—(B)	489
Vat Green GG Double Paste (s. s.)—(B)	5,000
Vat Khaki GG Paste—(B)	1
Vat Orange RRTS Powder (s. s.)—(B)	1,000
Vat Pink B Double Paste (s. s.)—(B)	3,062
Vat Yellow FFRK Paste—(B)	2
Vat Yellow RK Paste—(B)	1

Mordant and Chrome Dyes

Acid Anthracene Brown PG—(By)	257
Acid Anthracene Brown WSG—(By)	100
Anthracene Chromate Brown EB—(C)	200
Autochrome Olive B—(M)	250
Autochrome Olive Brown G—(M)	50
Brilliant Chrome Blue 2B Powder—(DH)	220
Chrome Printing Red B Powder—(DH)	441
Chrome Printing Red Y Powder—(DH)	220
Chromogene Azurine B—(M)	500
Chromovesuvine RA—(DH)	220
Metachrome Blue DL—(AG)	10
Metachrome Olive 2G—(AG)	500
Metachrome ed G—(AG)	500
Radio Chrome Blue B—(C)	500

Direct Dyes

Benzo Bronze GC—(By)	5
Benzo Fast Black L—(By)	441
Benzo Fast Blue FFL—(By)	3
Benzo Fast Blue 8GL—(By)	200
Benzo Fast Bordeaux 6BL—(By)	574
Benzo Fast Gray BL—(By)	500
Benzo Fast Heliotrope 4BL—(By)	1,200
Benzo Fast Orange 2RL—(By)	926
Benzo Red 12B—(By)	100
Benzo Rhoduline Red 3B—(By)	300
Benzoform Bordeaux R—(By)	1
Benzoform Yellow GL—(By)	50
Brilliant Fast Blue 3BX—(By)	500
Brilliant Orange GR Extra—(By)	485
Brilliant Pure Yellow 6G Extra—(By)	110
Brilliant Sky Blue B—(By)	500
Brilliant Sky Blue 2RM—(By)	718
Brilliant Sky Blue 8G Extra—(By)	331
Brilliant Triazol Fast Violet BL Powder—(AG)	336
Chlorantine Fast Brown RL—(I)	4,180
Chlorantine Fast Violet 4BL—(I)	220
Chlorantine Fast Violet 5BL—(I)	1,873
Columbia Catechine 3B—(AG)	25
Columbia Red OB—(AG)	100
Developed Brilliant Green 3G Powder—(By)	551
Developed Brilliant Scarlet 2BL Powder—(By)	441
Diamine Azo Brown G—(C)	529
Diamire Azo Fast Green G—(C)	511
Diamine Azo Fast Violet B—(C)	507
Diamine Azo Fast Violet R—(C)	507
Diamine Azo Fast Yellow 2G—(C)	226
Diamine Brilliant Scarlet S—(C)	1,000
Diaminogene GG—(C)	2,209
Dianil Fast Orange 2R—(M)	300
Dianil Fast Violet BL—(M)	200
Dianil Light Red 12BL—(M)	200
Diazanil Pink P—(M)	200
Diazo Brilliant Orange 5G—(By)	510
Diazo Brown 3G—(By)	2,023
Diazo Red N8B—(By)	220
Diazo Rubine B—(By)	400
Diazo Sky Blue 3GL—(By)	200
Diphenyl Fast Bordeaux G Conc.—(G)	130
Direct Black BO—(C)	20
Direct Black VT—(By)	3
Direct Cutch Brown GR—(1)	1,212
Direct Fast Heliotrope BL Powder—(By)	1,102
Direct Fast Violet B, BL—(By)	1,881
Direct Fast Violet 2RL—(By)	440
Direct Fast Violet FFBN—(C)	507
Direct Fast Violet FFRN—(C)	507
Direct Sky Blue 8G Extra Powder—(Q)	443
Fast Cotton Bordeaux 6BL—(AG)	5
Fast Cotton Corinth B—(AG)	25
Fast Cotton Scarlet 4BL—(AG)	5
Naphthamine Brown 2G—(K)	300
Paper Red A Extra—(B)	300
Paper Yellow 2GX—(B)	1,070
Paranil Brown 2BX—(AG)	10
Pluto Brown GG—(By)	100
Pyrazol Fast Brown B—(S)	500
Sky Blue N—(C)	500
Zambesi Black F—(AG)	1,000

Dyes for Artificial Silk

Artificial Silk Black R—(By)	300
Duranol Blue G Paste—(BD)	272
Duranol Red 2B Paste—(BD)	272
Duranol Violet 2R Paste—(BD)	180
SRA Blue IV—(Q)	2,480

Name of Dye and Manufacturer	Quantity (pounds)
Rapid Fast Dyes	
Rapid Fast Pink BL Paste—(AG)	200
Rapid Fast Red B Paste—(AG)	1,000
Rapid Fast Red BB Paste—(AG)	500
Basic Dyes	
Japan Black MBG—(B)	500
Rhodamine 6GDN Extra—(B)	7,805
Rhoduline Sky Blue 3G—(By)	20
Sulphur Dyes	
Cross-Dye Green B—(BD)	4,523
Immedial Brown W Conc.—(C)	1,000
Katigene Indigo CLGG Extra—(By)	800
Sulphur Black CLB—(AG)	10
Thionol Direct Blue S—(BD)	2,000
Color-Lake Dyes	
Black Base S—(B)	200
Brilliant Helio Blue FFR Extra—(By)	200
Ceres Red III—(By)	200
Ceres Violet I—(By)	3
Helio Bordeaux BL Paste—(By)	4,321
Helio Fast Scarlet RL—(By)	3
Helio Fast Yellow H10G—(By)	500
Helio Red RMT Extra Powder—(By)	300
Permanent Red F5R Extra—(A-G)	5
Red for Lake 2CL Powder—(G)	55
Stone Fast Yellow GG Extra—(B)	300
Stone Fast Yellow GN Lumps—(B)	200
Stone Fast Yellow 5G Paste—(B)	200
Photochemical Dyes	
Sensitol Green—(M)	1
Unclassified Dyes	
Blue 4830—(By)	100
Fast Blue WBL—(Q)	551
All other dyes—(Q)	35

SUPPLEMENTARY LIST OF DYE AND OTHER COAL-TAR CHEMICAL IMPORTS FOR THE PORT OF NEW YORK

The following list contains supplementary figures of imports of dyes during the first nine months of 1925.

Total supplementary dye imports, port of New York, 171,191 pounds, with an invoice value of $132,248.

Per cent by country of shipment: Switzerland, 58 per cent; Germany, 37 per cent; France, 3 per cent; other countries, 2 per cent.

DYES OF COAL-TAR ORIGIN

Colour Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
79	82	Scarlet 2R—(S)	500
124	129	Chromazone Red New Conc.—(G)	440
130	121	Erica B Extra—(A-G)	50
145	140	Jasmine High Conc.—(G)	1,10.
196	175	Acid Ponceau E—(G)	330
258	232	Bierbrich Scarlet R Med.—(K)	25
346	296	Cotton Yellow G Extra—(B)	200
382	319	Chloramine Red 3B—(S)	440
430	—	Polar Red R Conc.—(G)	1,102
436	358	Acetopurpurine 8B—(A-G)	100
448	363	Cotton Red 4BX—(B)	500
459	373	Congo Orange R—(A-G)	300
471	385	Minaxo Blue 4RX—(B)	500
518	424	Brilliant Benzo Blue 6B—(M)	500
631	14	Diphenyl Chrysoine GG—(G)	1,653
636	19	Kiton Fast Yellow 3G—(I)	661
658	496	Setoglaucine 753—(G)	551
667	503	Guinea Fast Green 3B—(A-G)	
		Poseidon Green SGX—(B)	590
671	506	Erioglaucine Extra High Conc.—(G)	661
707	539	Water Blue—(A-G)	200
712	543	Patent Blue V—(M)	500
714	545	Kiton Blue A—(I)	
		Poseidon Blue BR Extra—(B)	5,473
717	548	Acid Violet 6BN—(I)	2,204
735	564	Erio Green B Supra—(G)	551
737	566	Xylene Fast Green B Conc.—(S)	1,000
749	573	Rhodamine B Conc. (s. s.)—(G)	
		Rhodamine B Extra (s. s.)—(I)	5,505
758	582	Erio Fast Fuchsine BBL—(G)	661
789	—	Patent Phosphine M—(I)	661
797	608	Patent Phosphine GRNTN—(B)	400
801	613	Quinoline Yellow—(I)	220
814	617	Diphenyl Chlorine Yellow FF Supra—(G)	331
815	618	Basic Yellow T—(C)	500
827	671	Induline Scarlet—(B)	50
828	672	Azo Carmine GX—(B)	1,000
875	923	Fur Black DB—(A-G)	
		Fur Blue Black A—(A-G)	
		Fur Brown 2R—(A-G)	
		Fur Brown 4R Paste—(A-G)	
		Fur Gray BG—(A-G)	
		Fur Gray Brown SLA—(A-G)	
		Fur Yellow 4G—(A-G)	1,750
894	637	Gallamine Blue Extra Paste—(G)	5,028
922	659	Methylene Blue BGF Highly Conc.—(B)	100
924	660	Methylene Green W—(G)	1,102
1006	746	Pyrogene Green 3G—(I)	220
1027	778	Alizarine VI Old Paste—(B)	1,259
1034	780	Alizarine Red IWS—(M)	220
1037	783	Purpurine—(By)	3,902
1039	785	Alizarine GI Paste—(B)	1,242
1067	804	Alizarine Blue SB Powder—(M)	1,000
1096	760	Vat Golden Orange G Paste—(B)	55
1102	765	Vat Black BB Double Paste (s. s.)—(B)	4,242
1106	838	Indanthrene Blue RS Triple Pdr. (s. s.)—(B)	1,200
1113	842	Helin. Blue IGCD Dbl. Pst. Fine (s.s.)—(M)	1,000
1114	—	Helindone Blue IBCD Dbl. Pst. (s.s.)—(M)	2,000
1115	843	Cibanone Blue G Powder—(I)	110
1118	849	Indan. Yellow G Dbl. Pst. (s. s.)—(B)	
		Vat Yellow G Dbl. Pst. (s. s.)—(B)	
		Vat Yellow G Powder (s. s.)—(B)	6,416
1143	827	Anthra Bordeaux R Powder (s. s.)—(B)	400
1145	834	Helindone Gray IGK Powder (s. s.)—(M)	800
1152	—	Vat Brown G Paste—(B)	4,409
1163	832	Vat Violet BN Paste—(B)	1,497
1169	792	Cibanone Orange R Paste—(I)	
		Cibanone Orange R Powder (s. s.)—(I)	4,081
1170	795	Cibanone Yellow R Paste—(I)	1,102
1172	794	Cibanone Black B Paste—(I)	
		Cibanone Black 2G Powder (s. s.)—(I)	2,531
1186	883	Indigo MLB/6B Powder (s. s.)—(M)	500
1207	912	Anthra Red B Paste—(B)	1,426
1211	910	Helindone Pink BN Paste—(M)	
		Thioindigo Rose BN Extra Paste—(K)	2,060
1212	918	Ciba Red 3B Paste—(I)	1,432
1219	920	Helindone Violet BB Powder (s. s.)—(M)	500
1220	899	Ciba Gray G Powder (s. s.)—(I)	550
1222	901	Ciba Violet B Paste—(I)	
		Ciba Violet B Powder (s. s.)—(I)	23,368

Colour Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
1226	906	Ciba Red G Paste—(I)	441
1228	907	Ciba Scarlet G Extra Powder (s. s.)—(I) Ciba Scarlet G Extra Paste—(I) Thioindigo Scarlet 2G Paste—(K)	6,837
1229	908	Ciba Red R Paste—(I)	5,068
1230	911	Ciba Orange G Paste—(I)	441

UNIDENTIFIED DYES

Acid Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Blue RBF—(I)	220
Acid Rhodamine 3R—(I)	220
Azo Wool Violet 7R—(C)	500
Cloth Fast Yellow G—(I)	661
Guinea Light Blue A—(A-G)	100
Indocyamine B—(A-G)	1,000
Kiton Pure Blue V—(I)	2,204
Neolan Blue B—(I)	441
Neolan Gray B Old—(I)	220
Neolan Yellow R—(I)	220
Pilatus Copper Blue B—(B)	100
Radio Red G—(C)	300
Radio Yellow R—(C)	1,000
Wool Violet RC—(G)	55
Xylene Fast Blue GL Conc.—(S)	1,000

Vat Dyes

Anthra Pink B Extra Paste—(B)	1,500
Ciba Pink BG Paste—(I)	
Ciba Pink BG Powder (s. s.)—(I)	8,757
Ciba Printing Black B Paste—(I)	2,115
Cibanone Blue 2G Powder—(I)	220
Helindone Orange 14R Powder (s. s.)—(M)	125
Helindone Printing Black RD Paste—(M)	3,500
Hydron Pink FF Paste—(C)	550
Hydron Pink RF Paste—(C)	550
Hydron Scarlet 3B Paste—(C)	351
Hydron Yellow GG Paste—(C)	200
Vat Blue B Double Paste Fine (s. s.)—(B)	1,000
Vat Brown 2G Paste—(B)	551
Vat Brown RT Paste—(By)	205
Vat Orange 3R Powder (s. s.)—(B)	600
Vat Pink B Double Paste (s. s.)—(B)	2,646

Mordant and Chrome Dyes

Anthracene Chromate Brown EB—(C)	500
Chrome Fast Blue FB—(A-G)	100
Eriochrome Blue Black G—(G)	1,102
Naphthochrome Violet R—(I)	220

Direct Dyes

Benzo Fast Light Scarlet 4BL—(By)	100
Brilliant Congo Violet R—(A-G)	100
Brilliant Purpurine 10B—(A-G)	300
Brilliant Triazol Fast Violet BL Powder—(A-G)	224
Chicago Red III—(G)	2,204
Chlorantine Brown Y—(I)	661
Chlorantine Fast Blue 2GL—(I)	3,748
Chlorantine Fast Violet RL—(I)	26
Chlorantine Fast Violet 4BLN—(I)	661
Columbia Catechine G—(A-G)	1,200
Columbia Red O3B—(A-G)	300
Developing Blue B—(A-G)	500
Diamine Catechine G—(C)	200
Diamine Fast Orange EG—(C)	500

Name of Dye and Manufacturer	Quantity (pounds)
Diamine Fast Orange ER—(C)	500
Diaminogene GG—(C)	1,323
Diazo Black VG—(I)	551
Direct Brilliant Blue 8B—(I)	110
Direct Cutch Brown GR—(I)	3,306
Fast Cotton Gray BL—(A-G)	200
Fast Cotton Gray VL—(A-G)	300
New Bordeaux RX—(B)	50
Zambesi Black D—(A-G)	1,000
Zambesi Pure Blue 4BG—(A-G)	100

Dyes for Artificial Silk

Azonine Direct Red G Paste—(C)	700
Azonine Direct Yellow RR Paste—(C)	500
SRA Red III—(Q)	270

Sulphur Dyes

Pyrogene Brilliant Blue 6B—(I)	110
Pyrogene Brown G—(I)	441

INDUSTRIAL HEALTH CONSERVATION SOUND BUSINESS

Tuberculosis in industry is decreasing. The death rate during the past twenty years from this disease for the entire country has been reduced by one-half. A part of this gain at least, may fairly be attributed to the sunlight factories, exhaust fans, dust-protecting masks and other health measures, which have become commonplaces in industry. Yet physicians and health workers still urge employers to install further protecting measures for working men and women. And many employers are questioning whether the expense of such equipment is really justified as a sound business investment.

The labor turn-over and loss of time through illness still create a considerable loss to most employers of labor. To prevent this loss, and experts maintain that it is preventable, large industrial plants have installed departments of preventive medicine for their workers. In these all sorts of diseases are diagnosed and treated, their greatest efforts, however, being sometimes centered on tuberculosis prevention. This is thoroughly logical, for wholesome food, fresh air, exercise and sufficient rest, still the most reliable preventives as well as treatment for tuberculosis, also build up the physical resistance so that it can throw off almost any other kind of germ.

Industrial health work is being recognized more and more as a paying business investment. According to Frank L. Rector, M. D., secretary, Conference Board of Physicians in Industry, New York City, "The gains in improved morale and continuity of employment, to say nothing of the humanitarian questions involved, will make it a profitable investment."

It is one of the aims of the National Tuberculosis Association and its affiliated organizations to educate working men and women more in the rules of healthful living, thereby making them not only happier but more useful as producers. In order to further this campaign of education, the eighteenth annual sale of Christmas seals will be held throughout the country in December.

Dyeing of Cotton Warps

By Louis J. Matos, Ph. D.
National Aniline & Chemical Company

WARPS constitute one of the most important forms in which cotton is handled in the mill. They are made use of either in the gray state, bleached, or dyed. Their preparation demands a degree of care and oversight on the part of workmen usually not required for cotton in any other condition.

In discussing cotton warps, it is not out of place to briefly allude to the processes that are necessary to prepare them for bleaching or dyeing. Warps are made from cotton that has not been previously subjected to any chemical treatment, and consequently still contain all the natural impurities characteristic of the cotton fiber. These impurities consist chiefly of pectic matters, naturally fatty and waxy matters, and at times, some mechanical impurities that are picked up by the cotton as it proceeds from the bale-opening to the spinning and twisting. Unlike wool, cotton is not oiled.

After the warps are actually made, consisting of the desired number of "ends" or threads, they are either wound into large balls, or wound directly on beams. If the warps are to be subjected to chemical treatment, such as bleaching or dyeing, winding in the form of balls is most common.

Where warps are handled in large quantities, it is more economical and desirable to boil out and bleach in kiers, completing the operations with the least handling, including the final washing. Kier boiling and bleaching of warps is practised in both open and closed apparatus, but most kiers of modern construction are of the pressure type and consequently closed. Kier boiling is generally accomplished with the aid of caustic soda solution of such strength as to dissolve pectins and other matters. After boiling, the warps are thoroughly washed to remove the last traces of soda, when they are removed from the kier, hydroextracted, and dried over steam heated cans, or, while still in the damp state, sent into the dyehouse.

If the warps are to be bleached, this operation is carried out in the kier with the aid of a bleaching powder solution of suitable strength, but if the number of warps is not sufficient to fill a kier to the proper working level, they are "wet-out" in a five-compartment machine, passing successively through three solutions of soda ash, up to 10 deg. Tw., the last two compartments containing water only.

From this machine, the warps are bleached in a special tank filled with hypochlorite of soda solution standing at about 2 deg. Tw., and kept immersed until sufficiently bleached, after which the liquor is run off. The warps are then removed and passed through another five-compartment machine for washing, scouring and final washing. They are then ready to be used as straight bleached warps, or dyed light, bright shades.

Warps to be dyed medium or heavy shades are not bleached. After having been wetted out they go at once to the dye kettle.

Warp dyeing is a somewhat specialized branch of dyeing, and differs materially from almost every other class of dyeing. During the last twenty years warp dyeing has undergone some marked changes, principally as regards dyeing on the beam, a method that is destined to take the place of all other methods.

It is not necessary to describe the various types of warp dyeing machines, except to mention the standard form of single compartment apparatus that is still employed in many dyehouses. It is such a machine where the warp travels up and down successively over a series of six submerged and five outside rollers.

In preparing the dye bath, the usual custom is to make the dye liquor of suitable strength by adding the requisite amount of dye for each ten gallons of water, together with such assistants as soda ash and Glauber salt. In dyeing warps with diazotized and developed blacks, for example, National Diazine Black H Extra, use is made of continuous dyeing machines having several compartments, or the dyeing may be done in a single-box machine, and the diazotizing and developing in separate machines.

The National line of Erie and Niagara colors, including those adapted to after-treatment, or for diazotizing and developing, as shown in the new shade card of Direct Dyes for Cotton, embraces many types that are particularly suited for cotton warp dyeing.

CANADIAN DYE COMPANIES MERGE

A new dyestuff organization in Canada, known as the Consolidated Dyestuff Corporation and capitalized at $1,000,000, is the outcome of a recent merger of the leading Canadian dyestuff manufacturers and importers. The constituent companies of this merger include the following: Canada Colors & Chemicals, Ltd., Dyestuff Department of Toronto, Ont.; Grasselli Dyestuff Corporation, Ltd., of Toronto; Kuttroff, Pickhardt & Co.; McArthur Irwin, Ltd.; Pollock Bros. & Co., Ltd.; Rubinovitch & Haskell, Ltd. The last four companies are all of Montreal, and only their dyestuff departments are taken over. The head office of the company is located in the Read Building, Montreal.

The companies forming the Consolidated Dyestuff Corporation have enjoyed the sole importation rights for the larger German manufacturers, which, as is well known, recently merged under a new title.

LOADING ARTIFICIAL SILK

A German Patent, 403,990, has recently been taken out by the Deutsche Gasgluhlicht-Auer-Geschellschaft on the loading of artificial silk. The silk is treated with heavy metal hydroxides, such as tin, zirconium, the salts of the rare earths, etc., in the presence of ammonia in solution in an organic solvent. The silk may be dyed before or after loading. The salts of artificial silk so treated are not dissolved out by organic solvents and the luster of the material is not impaired.

MEN OF MARK

in the field of dyes and their application

HERBERT GRANDAGE

Superintendent of Bleaching, Mercerizing and Dyeing

Clark Thread Co., Newark, N. J.

HERBERT GRANDAGE was born in Bradford, England, June 12, 1891. At an early age he moved to the United States, and after graduating from the Philadelphia Central Manual Training High School in 1908 he continued his studies at the Philadelphia Textile School and at Pratt Institute, Brooklyn.

His first position in the textile field was as Assistant Dyer at the Industrial Dyeing & Finishing Company, Frankford, Philadelphia, where he remained two years. Later he became Laboratory Assistant and Color Matcher for Read Holliday & Sons, in New York City, which position he resigned to become Superintendent of Bleaching and Dyeing at the Bay State Thread Works, Springfield, Mass., where he remained until 1919. For the next two years he was Superintendent of Bleaching and Dyeing for Gerald Cooper, Providence, R. I. In June, 1921, he became Superintendent of Bleaching, Mercerizing and Dyeing at the Clark Thread Company, Newark, N. J., which position he still holds. In addition to exercising entire supervision of all chemical processes for the Clark Thread Company he is also Manager of the Bloomfield, N. J., works of the same company.

Mr. Grandage is regarded as one of the best informed and most progressive of the younger generation of dyers who have helped to raise the occupation from the rank of skilled labor to that of a highly trained technical profession. His popularity among all elements of the textile-chemical fraternity has led to his being the recipient of many honors. He was formerly Secretary and later Vice-Chairman of the New York Section of the American Association of Textile Chemists and Colorists, and is at present Chairman thereof. He comes of a long line of dyers centered about Bradford, England, there having been at one time or another no less than twelve of his family following the profession of dyestuff application.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

CLAYTON HOAGLAND
Managing Editor

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A DISTINGUISHED EXPONENT OF FAST FABRICS

IT is now well known in the trade that the use of fast colors in textile dyeing has been steadily increasing—almost as though a law had been passed prohibiting the use of inferior dyes where good fastness is essential. Without intentional exaggeration one can imagine a museum exhibit, a generation hence, of a piece of fabric with a sign attached, reading "Sample of dyed cloth that has run—now rare." And it is among the leaders in the dyeing trade that this movement has found its most diligent crusaders.

One of the more recent was a representative of the well-known Bradford Dyeing Association. This gentleman, R. W. Smith, speaking before a meeting in Providence of the Massachusetts-Rhode Island Laundry Owners, discussed the prevailing demand for fast fabrics and the resultant popularity among dyers of the highest types of fast dyes. He said that as far as responsibility for fastness is concerned the cause of many complaints can be traced to the converter who purchases fabrics of low grade and passes them to the dyer for finishing, usually with fugitive colors. In telling of the work of his firm and others in the industry he stated:

> Roughly speaking, there are three classes of colors dyed in our works and to some extent throughout the dyeing trade: First we have the ordinary direct colors, which are fugitive to washing, light and perspiration.
>
> Next we have the semi-fast type of colors usually referred to as developed colors. They cost a trifle more per yard than the direct colors and are slightly faster in some respects. Some are reasonably fast to washing and quite fugitive to light, while others are fair for sunlight and fugitive to washing. Even those used for wash goods will go in time.
>
> Finally, we have the actual fast type of color, shown at its best in our dyeing. These colors are fast to washing, perspiration, sunlight, and to a much stronger bleaching solution than would be used in a laundry.
>
> One of the arguments against the use of real fast colors . . . has been that they cost so much more that the customer will not pay for them. To-day this argument has little or no foundation. It is true that the fast colors are more costly to produce, but the difference is too small to justify the use of fugitive colors.

That last statement fully bears out our recently expressed contentions, in alluding to the investigation that has been undertaken by the Tariff Commission to find the average cost of the dyestuff in a given garment or fabric. When mill men accept as their guide to fastness the unanswerable fact, that the cost of the dye in a pair of silk hose or even in an entire suit is so infinitesimal as scarcely to deserve the least attention, then complaints will be virtually unknown and fastness guarantees will not be necessary.

"A FASCINATING STUDY"

THE approaching date of what will probably be the last battle in the Government's suit against the Chemical Foundation is brought to our somewhat flagging attention by the recent appearance among the nation's legal archives of a new Government brief. Is is, in the phrase of the literary critic, but one more novel constructed on a now hackneyed plot. After the usual vapid reiterations of conspiracy and error, presented "with prejudice toward none and courtesy toward all," etc., etc., the counsel for the Government proceeds to clear away what it regards as so much excess ballast that has been carried along with the case from court to court. One such point, in the Government's opinion, is the much-discussed importance of the American dye and chemical industry. This is a question entirely irrelevant to the case, declares the brief, and adds significantly "organic chemistry is undoubtedly a fascinating study but it does not aid us in determining what is the law."

There, summed up in one brilliant phrase, is the attitude that has been characteristic of every action taken by the Government in this case. Every assertion, every claim, every argument it has made characterize its counsel as legal in'c-fish, spouting contentions and then retreating behind a mass of absurd and elaborate technicalities. The law! the law! has been its cry from the beginning, unmodified by the least sense of common justice and equity.

The Supreme Court, before which the last trial will be held, has shown in many notable cases that it is actuated by a commendable consciousness of the *spirit* of the law as well as by its letter. Here may be found the broadest and most fair-minded conception of our law—the criterion of legal judgment. We wonder if the Government truly hopes to impress the Justices of the United

States Supreme Court, the most august body of its kind in all the world, by continuing to assume the rigid, hidebound attitude that has been so conspicuously typical of its action against the Chemical Foundation since the inauguration of the suit.

RAYON AND CHEMICAL INTERESTS TO CO-OPERATE

According to recent reports, the International Rayon Corporation, incorporated last month at Dover, Del., with a capital of $27,500,000, has established a co-operative working agreement with a large New York chemical concern for the production of dyes and chemicals used in rayon processing. It is understood that this company, in addition to producing rayon yarns by an improved viscose process, intends also to undertake extensive research work on a series of fast dyes for rayon. This pact with the chemical company, furthermore, will enable them to operate their plant under more efficient conditions, in that they will work out economical methods of recovering by-products and chemicals used in processing.

RUSSIAN DYE INTERESTS NEGOTIATE FOR AMERICAN INTERMEDIATES

A visiting commission of Russian chemists and chemical engineers recently returned to their country after an extensive trip among leading American and dyestuff manufacturing plants. It is fully expected that, as a result of the close relations growing out of the visit of this commission, commercial and credit agreements will be arranged between the Aniline Trust of Russia and chemical companies of the United States for the purchase of chemicals and intermediates for the manufacture of finished dyes in Russia.

While in this country the Russian commission made its headquarters with the All-Russian Textile Syndicate, which is naturally interested in the development of Russia's dye industry. The Russian chemists were assisted during their inspection of the plants here by the Syndicate's chemical consultant, N. M. Elias.

Mr. Elias made the following statement regarding the aims of the commission and its activities here:

"The purpose of this commission has been to study the American chemical industry generally and the newly developed organic chemical industry in particular, and also the scientific and technical institutions of the country as far as possible. It was also desired, and seems very probable, that commercial relations and credits will be established between the Aniline Trust of Russia and various chemical companies here for the purchase of chemicals and intermediates.

"Among the plants visited were those of E. I. du Pont de Nemours & Co., Calco Chemical Company, Sherwin-Williams Company, Merrimac Chemical Company, Swift & Co., the River Rouge plant of the Ford Motor Company and a number of others. Visits were also made to Columbia University, where the group was entertained by Prof. M. T. Bogert, to the Massachusetts Institute of Technology, and to some other scientific and technologic institutions.

"Dr. Landau, president of the Aniline Trust of Russia, has been very much impressed by the great development of the organic industry in this country in the short period of eight years. The great mechanicalization of manufacture, avoiding hand labor wherever possible, the large units of production and the large scale of American enterprise have all been of the utmost interest to him."

ARTIFICIAL SILK HOSIERY SHADE CARD

The General Dyestuff Corporation is distributing a new shade card issued by the Grasselli Dyestuff Corporation, entitled "Shades Fast to Light on Artificial Silk Hosiery." Forty-five different shades are exhibited on knitted artificial silk swatches, and a folder attached to the card gives complete dyeing directions. The colors shown are products of Farbenfabriken vorm. Friedr. Bayer & Co.

ACID COLORS FOR WOOL

A new and interesting shade card issued by John Campbell & Co. shows eighty-six acid colors on woolen yarns. The card comprises this manufacturer's Ethonic and Aceko colors, a complete line of standard colors for wool. Directions for dyeings are given for each class of colors. The card forms a reliable and convenient index to the Campbell line of acid colors.

BINDER FOR PEERLESS COLOR LEAFLETS

The Peerless Color Company, Plainfield, N. J., has just issued a small, very handsome green leather ring binder stamped in gold on the cover with the Peerless trade-mark. This binder is made to hold the leaflets issued from time to time showing specimen dyeings and describing the properties and methods of dyeing Peerless products. The two inserts issued with the binder show Primuline on a gingham swatch and Direct Brilliant Flavine S on artificial silk. Both leaflets give complete and instructive information on these colors, listing their fastness properties and explaining fully the best methods of dyeing with them on the various fibers for which they are suitable. Recipients of this binder will receive additional inserts in the future, and it will consequently form an up-to-date file of information on all Peerless products.

The plant, boiler house, foundry, real estate and numerous tenement houses of the Bowditch Dye Works, Hope Valley, R. I., were sold at auction at a liquidation sale on November 9 to Charles J. McIntire, whose address is not known, for $35,000. Some 163 lots were of dyeing and finishing machinery were also sold, in lots. The sale was held under the direction of G. L. & H. J. Gross, auctioneers, of Providence.

The Reduction Products of Azo Dyes

Part V

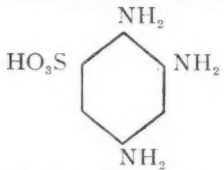
By WALTER C. HOLMES

Color Laboratory, Bureau of Chemistry

[EDITOR'S NOTE.—*The most practical and effective method for the identification of azo dyes consists in the isolation and identification of the products which they yield on reduction. This method finds less application than it might or should, partly because some of these products have never been isolated and investigated, and partly because much of the data which has been obtained in regard to such reduction products is greatly scattered and very difficult to locate.*

Mr. Holmes has made a search for all the available information on such reduction products, and this series contains a digest of his results with a systematic listing of the reduction products of the azo dyes published in the Colour Index, together with the available data on such properties and reactions as would be of service in their identification.]

No. 43.—1, 2, 4-TRIAMINOBENZENE-6-SULFONIC ACID

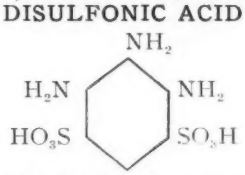


$C_6H_9N_3O_3S$; Mol. Wt. 203.19; (C, 35.4%; H, 4.5%; N, 20.7%; O, 23.6%; S, 15.8%).

Derived from: C. I. No. 160 by complete reduction.

Apparently no data are available on this product.

No. 44.—1, 2, 3-TRIAMINOBENZENE-4, 6-DISULFONIC ACID

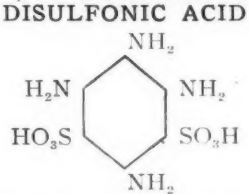


$C_6H_9N_3O_6S_2$; Mol. Wt. 283.26; (C, 25.4%; H, 3.2%; N, 14.8%; O, 33.9%; S, 22.6%).

Derived from: C. I. Nos. 222 and 368.

Apparently no data are available on this product.

No. 45.—1, 2, 3, 5-TETRAMINOBENZENE-4, 6-DISULFONIC ACID

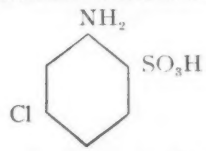


$C_6H_{10}N_4O_6S_2$; Mol. Wt. 298.26; (C, 24.1%; H, 3.4%; N, 18.8%; O, 32.2%; S, 21.5%).

Derived from: C. I. No. 233.

Apparently no data are available on this product.

No. 46.—3-CHLORANILINE-6-SULFONIC ACID



$C_6H_6ClNO_3S$; Mol. Wt. 207.61; (C, 34.7%; H, 2.9%; Cl, 17.1%; N, 6.7%; O, 23.1%; S, 15.4%).

Derived from: C. I. No. 156.

Red-brown glittering rhombohedra, difficultly sol. in H_2O.

Na salt ($+\frac{1}{2}H_2O$), yellow needles, or ($+2H_2O$) colorless needles.

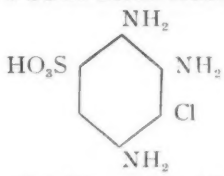
Na salt ($+H_2O$), small yellow needles, sol. in alc., effloresces.

Sr. salt ($+9H_2O$), long colorless needles, readily sol. in H_2O and alc., effloresces.

By elimination of amino group obtain *p-chlorbenzenesulfonic acid;—chloride*, needles (ether), mpt. 52-3°;—*sulfonamide*, yellow cryst., mpt. 140°.

May also be converted into *o-chlorbenzenesulfonic* acid by treatment with Na amalgam and replacement of amino group by chlorine;—*sulfonamide*, mpt. 187°.

No. 47.—3-CHLOR-1, 2, 4-TRIAMINOBENZENE-6-SULFONIC ACID

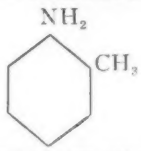


$C_6H_8ClN_3O_3S$; Mol. Wt. 237.64; (C, 30.3%; H, 3.4%; Cl, 14.9%; N, 14.7%; O, 20.2%; S, 13.5%).

Derived from: C. I. No. 149.

Apparently no data are available on this product.

No. 48.—o-TOLUIDINE



C_7H_9N; Mol. Wt. 107.12; (C, 78.5%; H, 8.5%; N, 13.1%).

Derived from: C. I. Nos. 17, 60-66, 256-262, 328, 329 and 638.

Colorless oily fluid. Dimorphous, mpt.; α, —21°; β, —15.5°. Boils at 197-200°. D. 1.003 at 15°. Volatile with steam (.34 gm. passing over with 1 liter).

Acetyl deriv., orthorh. cryst., mpt. 109-10°. .86 part sol. in 100 H_2O at 19°, 8.08 parts in alc. Bpt. 296° (172° at 11 mm., 227° at 100 mm.).

[Cl derivs.—see J. Am. Chem. Soc. *47*, 1095.]

Aceto-acetyl deriv., rect. prisms (ethyl acetate), mpt. 107-8°.

Diacetyl deriv., pyramids, mpt. 18°. .....

Salts.—Hydrochloride, mpt. 215°; hexabromplatineate, shining yellow-red, silky needles, mpt. 225-6° (decomp.); *benzene sulfonate*, mpt. 176°, sol. in 5 parts H_2O at 19°; *α-naphthalene sulfonate*, mpt. 237°, .99 gm. salt in 100 gm. aq. sol. at 15°; β-naphthalene-sulfonate, mpt. 213°, .47 gm. salt in 100 gm. aq. sol. at 15°; *2, 7-naphthalene disulfonate*, mpt. 238°, 6.1 gm. salt in 100 gm. aq. sol. at 15°; *2, 6-naphthalene disulfonate*, mpt. 338° (decomp.), .78 gm. salt in 100 gm. aq. sol. at 15°.

Additive comp.—with $SbCl_3$, long colorless needles (alc.) mpt. 148°; with *2, 4, 6-trinitrobenzaldehyde*, mpt. 106°; with 2, 4, 6-trinitrostilbene, red glittering leaflets, mpt. about 120°; with *tetryl*, brick-red cryst. (C_6H_6), mpt. 63°; with *sym. trinitroethylbenzene*, blood-red prisms (alc.), mpt. 35°.

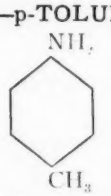
Condensation products; with 2, 4, 6-trinitrobenzaldehyde, *2, 4, 6-trinitrobenzal-o-toluidine*, yellow, mpt. 177°; with tetranitraniline, *2, 4, 6-trinitro-3-aminophenyl-o-toluidine*, dark-red, mpt. 200°; with α-halogen-β-naphthols, *1-o-tolylamino-2-hydroxynaphthalene*, mpt. 114-5°; with 1-chlor-2, 4-dinitrobenzene, *2, 4-dinitrophenyl-o-toluidine*, citron-yellow cryst. (alc.), mpt. 120°; with 3, 4, 6-trinitrotoluene, *4, 6-dinitro-3, 6'-dimethyldiphenylamine*, brown-red, mpt. 99°, with 2, 3, 5-t.n.t. the 2, 2'-isomer of the preceding, tangerine-red, mpt. 109°. With p-brombenzenesulfonyl chloride the product obtained melts at 116°;—with α-dinitrochlorbenzene the product melts at 101-2°.

Diazotized and coupled with;—*β-naphthol*, red needles (Ac HO), mpt. 128°, wine-red sol. in H_2SO_4, yellow-red pptte. on dil.;—*Naphthol AS*, glistening bronze leaflets (Ac HO), mpt. 220°, wine-red sol. in H_2SO_4, light red pptte. on dil.;—*α-naphthol-2-sulfonic* acid, see J. Assoc. Off. Agr. Chem. *6*, 16, for absorption data.

Shaken with CS_2 and H_2O_2 it gives sym-di-o-tolylsulfourea, mpt. 165°.

Filter paper impregnated with o-toluidine gives an orange-brown color if dipped in dil. H_2SO_4 containing a few drops of HNO_3 and then in conc. H_2SO_4.

No. 49.—p-TOLUIDINE



C_7H_9N; Mol. Wt. 107.12; (C, 78.5%; H, 8.5%; N, 13.1%).

Derived from: C. I. No. 125.

Colorless plates or leaflets. Mpt. 45°, Bpt. 200-1° (86-7° at 10 mm.), D. 1.046. Volatile with steam (33 gm. passing over with 1 liter). Dissolves in 285 parts H_2O at 11.5, in 135 parts at 21°.

Acetyl deriv., monocl. rhomb., mpt. 153°, bpt. 307°, .0886 parts sol. in 100 cc. H_2O at 22°, 8.416 parts in alc. *Aceto acetyl deriv.*, prisms (ethylacetate), mpt. 94-5° (Ewins and King); white flat plates (H_2O), mpt. 89° (Dains and Harger). *Diacetyl deriv.*, colorless cryst., mpt. 48°.

Salts. Picrate, long, light-yellow prisms, mpt. 169° (decomp.), 100 parts H_2O at 18.5° dissolve .54 parts salt. 100 parts 95% alc. at 18° 23.33 gm. salt; *hexabromplatineate*, glistening yellow-red spears and plates, mpt. 268-9°; *benzene sulfonate*, mpt. 205°, 7.4 gm. salt in 100 gm. aq. sol. at 16°; *α-naphthalene sulfonate*, mpt. 181°, 1.38 gm. salt in 100 gm. aq. sol. at 15°; *β-naphthalene sulfonate*, mpt. 221°, .47 gm. salt in 100 gm. aq. sol. at 16°; *2, 7-naphthalene disulfonate*, mpt. 299°, 1.07 gm. salt in 100 gm. aq. sol. at 15°; *2, 6-naphthalene disulfonate*, mpt. >360°, .20 gm. salt in 100 gm. aq. sol. at 15°; *anthraquinone-β-sulfonate*, needles, mpt. 308°, sol. in 2,500 parts H_2O.

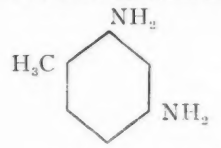
Additive comp.—with $SbCl_3$, colorless cryst., decomp. above 120°;— with *tetryl*, deep red needles, mpt. 54°;— with *sym. trinitrotoluene*, long red needles (C_6H_6), mpt. 68-70°;—with *sym. trinitroethylbenzene*, blood-red needles, mpt. 25°; with *bromonitro-styrene*, gold-yellow plates (alc.) mpt. 107-8°.

Condensation prod.;—with tetryl, *2, 4, 6-trinitrophenyl-p-tolylamine*, orange-red needles or blood-red prisms, mpt. 163-5°; with α-halogen-β-naphthol, *1-p-tolylamino-2-hydroxynaphthalene*, mpt. 138-9° (Methyl ether, mpt. 94°); with tetranitraniline, *2, 4, 6-trinitro-3-aminophenyl-p-tolylamine*, orange mpt. 220°; with 2, 4, 6-trinitrobenzaldehyde, *2, 4, 6-trinitrobenzal-p-toluidine*, mpt. 179.5°; with 1-chlor.-2, 4-dinitrobenzene, *2, 4-dinitrophenyl-p-toluidine*, red needles (alc.) mpt. 131°, with 1-brom.-3, 4, 6-trinitrobenzene, *5-brom.-2, 4-dinitro-4'-methyldiphenylamine* bright yellow prisms, mpt. 164-5°. With p-brombenzensulfonyl chloride the product obtained melts at 98°.

Diazotized and coupled with;—*β-naphthol*, orange-red needles (Ac HO), mpt. 130°, wine-red sol. in H_2SO_4, orange-red pptte. on dil.;—*Naphthol AS*, red needles with green reflex (Ac HO), mpt. 225°, wine-red sol. in H_2SO_4, light red pptte. on dil.;—with *α-naphthol-2-sulfonic acid*, see J. Assoc. Off. Agr. Chem. *6*, 16, for absorption data.

Filter paper impregnated with p-toluidine gives a rose-red color when dipped in dil. H_2SO_4 containing a few drops of HNO_3 and then in conc. H_2SO_4.

No. 50.—m-TOLYLENEDIAMINE



$C_7H_{10}N_2$; Mol. Wt. 122.13; (C, 68.8%; H, 8.3%; N, 22.9%).

Derived from: C. I. 332 and (by complete reduction) from 68.

Long needles or rhombic prisms. Readily sol. in alc., ether or hot H_2O. Mpt. 99°. Bpt. 280°.

Sulfate ($+2H_2O$), long monocl. prisms, 100 parts H_2O at 19.5° dissolve 5.58 parts salt.

2-Acetyl deriv., white needles (alc.), mpt. 140°, sol. in alc., ether or hot H_2O, gives a difficulty sol. salt (yellow needles) with platinic chloride.

2-Chloracetyl deriv., mpt. 230-1° (decomp.).

4-Acetyl deriv., long needles (H_2O), mpt. 161-2°; *hydrochloride*, needles, mpt. 263-4°. By oxidizing the acetyl comp. with Caro's acid the *2-nitroso* deriv. is obtained, pale yellow-brown cryst. (alc.), mpt. 195°, sol. in Ac HO but insol. in C_6H_6 or H_2O.

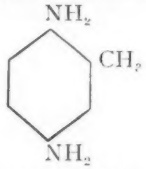
Diacetyl deriv., white, lustrous needles (H_2O), mpt. 224°.

Dibenzoyl deriv., plates (Ac HO), mpt. 224°, difficultly sol. in alc.

Gives a red-brown color with nitrous acid. With Na_2O_2 it gives p-nitro-o-toluidine at moderate temp. and 2, 4-dinitro phenol at boiling temp. The condens. prod. with

α-dinitrochlorbenzene (red plates) melts at 184°; acetyl deriv., mpt. 163-4°.

No. 51.—p-TOLYLENEDIAMINE



$C_7H_{10}N_2$; Mol. Wt. 122.13; (C, 68.8%; H, 8.3%; N, 22.9%).

Derived from: C. I. Nos. 17, 256-262, 266, 283-6 and 313.

Leaflets or colorless plates, mpt. 64°, bpt. 274°. Readily sol. in H_2O, alc., ether and hot C_6H_6, difficultly sol. in cold C_6H_6.

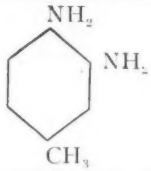
Sulfate, 100 parts H_2O at 11.5° dissolve .84 pts. salt.

5-Acetyl deriv., oxidized with Caro's acid gives *5-acetylamino-o-toluidine*, green needles (alc.), mpt. 128-9°, sparingly sol. in ether, readily sol. in Ac HO.

Diacetyl deriv., pale brown cryst. mpt. 220°; oxidized with $KMnO_4$ gives *2, 5-diacetylaminobenzoic acid*, colorless cryst. (alc.), mpt. 262° (decomp.); with acetic anhydride gives *5-acctaminoacetanthranil*, mpt. 253° (cor.).

Oxidized in presence of aniline or o-toluidine it gives blue-green indamines which are converted into safranines on boiling.

No. 52.—3, 4-DIAMINOTOLUENE



$C_7H_{10}N_2$; Mol. Wt. 122.13; (C, 68.8 %; H, 8.3%; N, 22.9%).

Derived from: C. I. Nos. 67, 69 and 70.

Nearly colorless plates or needles (light petroleum), mpt. 88.5°, bpt. 265°. Moderately sol. in cold H_2O, the sol. soon turning dark in air.

3-Acetyl deriv., mpt. 95°, (anhydro base, mpt. 145-50°); gives a diazoimide with nitrous acid, pale yellow monocl. cryst., mpt. 93-4°.

4-Acetyl deriv., mpt. 110-2°, (anhydro base, mpt. 203°); gives a diazoimide with nitrous acid, mpt. 120°, volatile with steam.

Diacetyl deriv., long prisms, mpt. 210°.

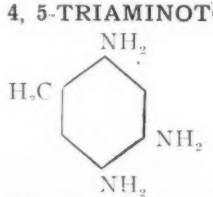
3-Benzoyl deriv., colorless needles (C_6H_6), mpt. 158°; gives a diazoimide, long colorless needles, mpt. 122-3°.

4-Benzoyl deriv., colorless lustrous needles (alc. or C_6H_6) mpt. 193-4°; gives a diazoimide with nitrous acid, colorless needles, mpt. 127-8°.

Dibenzoyl deriv., mpt. 263-4°.

With phenanthrene quinone it forms a quinoxaline deriv., faint yellow needles (alc.), mpt. 204°, sol. in H_2SO_4 with yellow-red color.

No. 53.—2, 4, 5-TRIAMINOTOLUENE

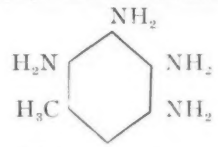


$C_7H_{11}N_3$; Mol. Wt. 137.16; (C, 61.3%; H, 8.1%; N, 30.6%).

Derived from: C. I. Nos. 21, 60, 101, 332, 345, 506, 569, 575, 577, 582 and 613.

The free base is very unstable and is oxidized easily. Gives cryst. sulfate and hydrochloride ($C_7H_{11}N_3.3HCl$). Sols. of the salts reduce silver sol. in the cold. The salts in a moist condition soon turn red. On warming them with dil. H_2SO_4 an intense blue color develops which disappears on the addition of alc. The hydrochloride gives a brown dye with potassium nitrite.

No. 54.—2, 3, 4, 5-TETRAMINOTOLUENE



$C_7H_{12}N_4$; Mol. Wt. 152.16; (C, 55.2%; H, 7.9%; N, 36.8%).

Derived from: C. I. Nos. 561 and 570.

The free base is very unstable. Forms two series of salts ($C_7H_{12}N_4.2H_2SO_4$, leaflets; $C_7H_{12}N_4.H_2SO_4$, small leaflets, insol. in alc.).

By heating the sulfate with acetic anhydride and sodium acetate *triacetylethenyltetraminotoluene* ($+H_2O$), needles, mpt. 305° is obtained. On treatment with HCl this yields *diacetylethenyltetraminotoluene*, leaflets, mpt. 282°.

A NEW PROCESS FOR CLARIFYING AND DECOLORIZING WASTE WATERS

(*Continued from page 786*)

colorizing waste liquors from dyeing plants and which gave the next best results was tan bark or tan liquor. This was followed by peat, then straw and chaff. The last named substance contains so much silica that the coloring mater could scarcely penetrate into the fibers. There are, of course, other materials which may be available in the locality of a particular dyeing establishment which may be used for this purpose with fairly good results.

As far as the mechanical details of the process are concerned, these are not of any great moment. It is, of course, essential that the apparatus employed for decolorizing waste waters occupy as little space as possible and require the least amount of attention. The principle of the treatment consists first in spraying or centifuging the colored waste waters or aerating them in some other suitable manner so that certain coloring matters, which will be precipitated by oxidation, are given a chance to oxidize. Then the liquors are brought into a reaction tank and lime or other similar chemicals are added and the precipitated substances as well as the precipitates which are derived directly from the manufacturing processes themselves are removed from the solution. This may be accomplished, for example, with the aid of a sand filter, wherein the topmost layer of sand, which contains a certain amount of color slime of inconsiderable quantity, is removed now and then during the filtering operations, and either dumped away in some suitable place or calcined and thereafter washed free from all coloring matter and used over again in the filter.

As far as the actual color removal process is concerned it is most advisable to have a colored waste liquor which is, however, free from sediments so that the speed of travel of the waters through the sawdust or other decolorizing agent is not unduly reduced by the deposition of slimes and sediments.

The apparatus employed in the actual decolorizing process consists of a machine that is built much like a compartment drier. The sawdust is contained in a number of separate compartments in the machine, and are located one after the other, so that the waste waters pass from one into the next. Each individual compartment possesses proper inlet and outlet ports so that it is possible to connect each of these compartments to the first one in the series or to the last. In this manner the decolorization of the waste waters takes place in a continuous manner and a certain proportion of the coloring matter is removed in each compartment in the apparatus. Thus, in spite of the considerable volume of material that is present in the apparatus the coloring matter is removed in stages rather than being separated out in any one compartment. This, of course, makes for better efficiency of the decolorizer, and the sawdust and wood shavings when removed from the apparatus are thoroughly impregnated with color so that they cannot absorb any more.

In some cases it is advisable to have two such decolorizing boxes available on the plant so that when the sawdust in one has become saturated with the coloring matter it can be taken out of service and the spare decolorizer put into service while the first one is being cleaned out. The colored sawdust or other decolorizer is removed from the box and is carried away to be dumped in the proper place or else it is pressed together in an ordinary hand press until the water content is reduced to approximately 70 to 80 per cent and then it can be burnt as fuel under the boilers in the power plant.

The costs of the process are made up of the sawdust used therein, which, it has been seen, does not go to waste entirely, of the chemicals that are added and of the amortization and power requirements of the apparatus. When the expense that is created by trying to get rid of colored waste waters is figured and the trouble that arises therefrom is taken into consideration it will be concluded that the cost of the new process is immaterial.

Dyestuff Tables

A List of the Principal American-Made Colors with Their Properties and Fastness Characteristics

[NOTE: The publishers of The REPORTER have secured more or less complete data in regard to many of the dyestuffs which are at the present time being manufactured in the United States. As the following material has been brought together from various sources, they realize that errors are quite likely to appear, and it is earnestly requested that any readers who find errors or who are able to give additional information will communicate with the publishers in order that this material may be made as correct, complete and up to date as possible. These tables will appear serially until all colors upon which we have data shall have been covered. The publication of this data was begun in the issue of March 10, 1924.]

VICTORIA FAST VIOLET 2R

COMPOSITION: Similar to S-61.

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: Glauber salt and sulphuric acid.

SHADE: Victoria Violet is bluer than Erio Violet RL.

SOLUBILITY: Good.

LEVEL: Dyes level.

EXHAUSTS: Well.

FASTNESS TO:

Acid: Fast.
Alkali: Fast.
Carbonizing: Fast.
Light: Next to Anthraquinone Violet in this respect.
Rubbing: Fast.
Steaming: Fast; Erio Violet RL slightly inferior.
Sulphur: Redder.
Washing: Fast.

ON UNIONS: Cotton-effect threads as well as silk-effect threads when dyed with acetic acid remain pure white.

ON OTHER MATERIALS: Adapted for dyeing silk.

PRINTING: Suitable for direct printing on wool and wool silk.

COMPETING PRODUCTS: Made in the United States by Grasselli Dyestuff Corporation, under name of Victoria Fast Violet 2R; Cincinnati Chemical Works, under name of Erio Violet RL; Garfield Aniline Works, under name of Victoria Fast Violet 2R; National Aniline & Chemical Company, under name of Fast Wool Violet 2R; Newport Chemical Works, Inc., under name of Fast Acid Violet RM; Palatine Aniline & Chemical Company, under name of Empire Fast Violet AA.

CLOTH RED BCA

(Old name Cloth Red BC)

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: With acetic acid.

SHADE: Bordeaux; like S-236.

SHADE BY GASLIGHT: No change.

SOLUBILITY: Better than S-236.

LEVEL: As a self-shade, good. In combination does not dye level.

EXHAUSTS: Clear.

FASTNESS TO:
Acid: Good.
Alkali: Dyeings turn a trifle bluer, but better than S-233.
Carbonizing: Fast.
Fulling: Against white wool, fair; against white cotton, moderate.
Light: Slightly inferior to S-233.
Rubbing: Moderate.
Steaming: Fast.
Sulphur: Turns yellower.
Washing: Fair.

OTHER PROPERTIES: Color should be dyed weakly acid, top chrome or chrome mordant.

ON UNIONS: Exhausts well on wool in a neutral bath of Glauber salt.

ON OTHER MATERIALS: Gloria: The wool is deepest. Silk: The dyeings are not fast to water.

PRINTING: Well adapted for direct printing on wool with addition of 7 per cent acetic acid 60 deg. Be. The fastness of the print is better than S-236.

DISCHARGING: Discharges white with sulphoxalates.

COMPETING PRODUCTS: Made in the United States by Grasselli Dyestuff Corporation.

TARTRAZINE SEA

(Old name Tartrazine SE)

COMPOSITION: Pyrazolone.

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: Glauber salt and sulphuric acid.

SHADE: Redder than S-23.

SOLUBILITY: Very good.

LEVEL: Better than S-23.

FASTNESS TO:
Acid: Equals S-141.
Alkali: S-141 a little better.
Carbonizing: Good.
Cross-Dyeing: Moderate.
Fulling: Moderate.
Ironing: Fast.
Light: Excels S-141.
Perspiration: Moderate.
Rubbing: Fast.
Steaming: Fast.
Street Dirt: Fair.
Sulphur: Fast.
Washing: Moderate.
Water: S-23 is better.

DYED BY OTHER METHODS: Chromed no better.

ON UNIONS: Dyed acid, cotton-effect threads are not stained. Neutral: Not suitable.

ON OTHER MATERIALS: Silk: Fastness to washing and water poor. Paper: Better affinity than S-23.

COMPETING PRODUCTS: Made in the United States by Grasselli Dyestuff Corporation.

ACID ANTHRACENE BROWN RHA

(Old name Acid Anthracene Brown RH Extra)

COMPOSITION: Similar to S-88.

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: Glauber salt, acetic, sulphuric and 2 per cent chrome.

SHADE: More on the violet than S-88.

SHADE BY GASLIGHT: Redder.

SOLUBILITY: Excellent.

LEVEL: Dyes level with care.

EXHAUSTS: Same as S-88.

FASTNESS TO:
Acid: Not quite as sensitive to acid as S-88. Excess of mineral acid must be avoided.
Alkali: Good to ammonia and soda.
Carbonizing: Turns redder.
Fulling: Good. When fulled strongly it bleeds into the cotton.
Ironing: Good.
Light: Better than S-88.
Perspiration: Fast.
Potting: Moderate.
Rubbing: Fast.
Steaming: Turns somewhat yellower when steamed for one hour at 14 pounds. Turns duller when steamed one hour at 33 pounds.
Sulphur: Turns somewhat redder.
Copper: Shade goes redder.

OTHER PROPERTIES: Dyed direct, an orange is produced of no interest.

DYED BY OTHER METHODS: Dyed on a chrome mordant, the color is yellower and fuller than dyed top chrome. The chrome-mordant dyeings are not as fast to fulling and carbonizing as the top-chrome dyeings. By after-treating the chrome-mordant dyeings with ½ per cent of chrome, complete fastness in this respect is obtained, however. Chrome-mordant dyeings are faster to steaming than those top-chromed. Cotton-effect threads are stained only a little.

ON OTHER MATERIALS: Gloria: No interest. Hats: Dyed chrome mordant, penetrates well; fast to crocking.

PRINTING: Wool suitable.

DISCHARGING: Not a pure white with hydrosulphite.

COMPETING PRODUCTS: Made in the United States by Grasselli Dyestuff Corporation.

ACID ANTHRACENE BROWN VA

(Old name Acid Anthracene Brown V)

COMPOSITION: Similar to Pikramic Acid Brown.

SPECIALLY SUITABLE FOR: Wool, top-chromed.

(Continued on page 814)

Technical Notes from Foreign Sources

Dichroism of Colored Ramie Fibers

Ramie fiber which has been colored with arsenic, antimony, bismuth, selenium, tellurium, bromine, iodine, rhodium, palladium, platinum, copper, silver, gold, or mercury also exhibits selective absorption. The dichroism which is caused by the non-metals and metalloids is sharper the more metallic the element. In opposition to Braun's lattice theory, the fibers are brighter with some elements when the electrical vector is perpendicular to the direction of the fiber. All the optical observations, especially the fact that liquid substances (mercury and bromine) produce dichroism and that the dichroism remains, although a chemical change is brought about in the fiber, appear to indicate that the adsorbed coloring matter is not present in the form of minute crystals, but as free ions, atoms or molecules. (Naturwiss, 1925, pages 405 to 406.)

Dyeing Mordanted Wool

Wool is mordanted by treating it with a hot liquor which contains a dichromate, a reducing agent, and such a quantity of an acid that the liquor, after mordanting, is slightly acid and is exhausted of chromium salts, so that the subsequent dyeing process may be carried out in the same liquor. This in substance is the principle of the dyeing process which is patented in British Patent No. 236,388.

Glycerine, dextrose, starch, dextrin, urine and tanning extracts are suitable reducing agents, and acetic, formic, lactic, hydrochloride, and sulphuric acids may be used to maintain the acidity of the liquor. White wool and recovered wools, that is, containing cotton, are mordanted with not more than 1.75 per cent and 0.5 to 0.75 per cent of a dichromate respectively, but the latter wool requires a greater amount of reducing agent.

For example, wool slubbing is mordanted by immersion for about one hour in a boiling liquor which contains 1.5 per cent of glycerin, 1 per cent of hydrochloric acid, and 1 per cent of sodium dichromate, the last named being added after introduction of the wool. In another process 1 per cent of sodium dichromate, 2.5 per cent of maize dextrin, and the same proportion of an 80 per cent acetic acid are used.

Nitrosamine in Printing

Sodium ortho-nitrotoluenesulphonate which is known as reserve salt W is suitable for the production of white or colored resists under vat coloring matters. The colored resists are obtained by means of printing pastes which contain nitrosamines and a base such as beta-naphthol. This is the principle of the process described in Bull. Soc. Ind. Muhlhouse, 1925, volume 91, pages 320-1.

For example, red effects are obtained by printing the fabric, which may or may not be prepared with ammonium acetate, with a paste which contains per kilogram 150 grams of nitrosoamine of nitroanisidine, 450 grams of neutral gum, 200 grams of sodium ortho nitrotoluene sulphonate, 50 grams of zinc oxide, 50 grams of glycerine, 10 grams of beta-naphthol and 40 grams of sodium hydroxide of 20 deg. Be. concentration, density 1.16. Then the fabric is dried, padded with a vat coloring matter solution, dried and washed and soaped in the usual manner. Yellow effects are obtained by the use of the nitrosoamine of dichloroaniline.

Treating Artificial Silk

Artificial silk and products that are made from the silk show improved resistance to liquids while retaining their softness and affinity for coloring matters if they are treated either simultaneously or successively with aldehydes, particularly formaldehyde, and alkalies or alkaline salts or organic bases, and, after removal of the excess of liquor, heated to a temperature above 90 deg. Cent., preferably between 120 and 170 deg. Cent., under such conditions that any moisture that remains in the fibers may escape. The treatment with formaldehyde and consolidation at a temperature of 120 to 170 deg. Cent. may, if desired, form one operation.

Examples of basic reagents which may be used in this process are alkali hydroxides, alkali or alkaline earth salts of acetic acid, lactic acid, citric acid, etc. (particularly alkali formates), alkali or ammonium carbonates, borates, phosphates, silicates, oleates, and ammonium salts of acids which are weaker than dichloroacetic acid and stronger than acetic acid. Mixtures of bases or salts may be employed such as sodium hydroxide and pyridine or sodium oxalate and sodium formate. Air or inert gases may be passed through the apparatus during the heating process. (British Patent No. 234,618.)

Coloring Paper According to Sample

In the coloring of paper according to sample the first condition that must be observed is that the paper mass behaves in a neutral manner toward the coloring matter that is employed in the process. However, it has happened more than once that in the preliminary tests, made before the coloring matter is added to the beater, the correct shade has been obtained, but when the exact same amount of coloring matter was added to the paper mass in the beater a different shade was obtained.

The reasons for these errors in coloring paper to sample may be very different and for this reason it is impossible to discuss them in general and to advocate any general solution of the problem. In the first place, it is absolutely necessary that all the containers and other apparatus employed in the coloring process be kept as scrupulously clean as possible. Care must be seen that

no coloring matter from a previous coloring process remains.

The class of coloring matter employed in the dyeing process depends most particularly on the purpose to which the colored paper is to be used. The most useful colors for this purpose are the basic dyes, as they are distinguished by their great resistance to light and by their high coloring capacity. It is also very common to find mixtures of basic and acid coloring matters employed for this purpose. It is also possible to obtain very uniform results by a careful addition of alum. The salt is added in two portions, one before the dyeing process and the other after the coloring is completed. The acid coloring matters are used alone only on papers which are very highly loaded and also for making marbled papers. The amount of alum and rosin added to the beater varies in accordance with the shade that is desired on the finished paper.

The substantive coloring matters, which are particularly well suited for the dyeing of paper owing to their affinity for the vegetable fiber, are used only for the better grades of papers, as, for example, envelope paper, etc. These colors are also employed in conjunction with the acid dyestuffs and when used in this manner they yield very regular shades, whose brilliancy is altered by the degree to which the acid dye is admixed with them. Under all conditions when coloring paper it is necessary to take special care to see that the coloring matter is completely dissolved in the solution before it is added to the paper beater. If this is not done then it is very likely that a finished paper will be obtained which will be undesirable because of its spotty condition. When the process is being carried out with a number of different coloring matters then as far as possible separate solution tubs should be used for each color. When this is impossible then the greatest care must be exercised to see that the vessels that are employed are as clean as possible before they are employed for dissolving another coloring matter. (Deutsche Faerber Zeitung, 1925, page 869.)

Uniform Shades on Cotton Piece Goods

How to obtain uniform dyeings on cotton piece goods is the subject of an article that was published in Deutsche Faerber Zeitung, 1925, pages 1147-8.

Many times the dyed cotton goods are found to be covered with spots. The question is: Where does the trouble lie? It is often of great advantage that the textile man has a chemical training, for it is only at times by the use of analytical chemical methods that it is possible to trace the cause to its source. Thus it is possible that after the goods have been bleached they still contain appreciable amounts of chlorine or acid, or there may have been formed in the fabric a certain proportion of oxycellulose or hydrocellulose, which will surely result in the formation of spots on subsequent dyeing of the fabric. Then again in the mercerization of the fabric wet spots may be formed due to the improper removal of the sizing from the fabric before it was put through the mercerizing process. The most troublesome feature of the entire process is that once the spots have been formed on the fabric it is a very difficult matter to repair the injury and this can be done only at high cost.

In the aforementioned article there is contained a discussion of the various conditions that promote the uniform dyeing of the fabric.

The substantive coloring matters are most frequently used for this purpose in color baths which also contain Glauber salt or common salt. The coloring matter is dissolved in boiling water, and when dyeing light shades it is first passed through a fine screen. When dyeing bright to moderately bright shades the operation should be started at lower temperatures. No salt should be added in this case for the reason that the coloring matter will produce the proper light shade on the fabric without the addition of the salt. If it should happen that salt must be added, then it is introduced into the color bath in the third or fourth passage of the piece goods through it, but never in the first passage.

If this proceedure is not adhered to, then it will often be found that the coloring matter goes on the fiber so energetically that a spotty effect can easily be produced, for it is evident that the salt has the effect of rendering the coloring matter less soluble in the bath and thus enhancing its absorption by the textile fiber.

Among the substantive coloring matters there are a certain number of the so-called developed dyestuffs. When these coloring matters are employed the dyer has plenty of opportunity to make an error and produce a spotted fabric. The trouble is that chemical operations are performed in the dyeing process. Thus the diazotization must take place at a certain temperature and with ice cooling; if the temperature is allowed to go higher, then poor results will be obtained. Furthermore, the effect of light is very deleterious. When coupling is performed, it is always advisable to remove the steam pipe. When the temperature of the water is too high, then coupling may be incomplete and the result is, for example, in the case of Diamine Nitrazol Green GF, a violet green spotted dyeing. It is evident that in dyeing with the developed coloring matters it is necessary to use skilled labor.

The basic coloring matters, because of the fact that they are lacking in fastness are but seldom used for this purpose. In their use when the goods cannot be properly steeped in the tannin liquor overnight, the bath can be brought to the boiling temperature and the tannin mordant can be properly applied by passing the cloth six times through the bath containing from 2 to 6 per cent of the tannin mordant according to the depth of shade to be produced. The tartar emetic operation is then directly applied to the goods, without preliminary washing, and then the dyeing can commence. The colors that are produced with these dyestuffs are particularly brilliant and are not equalled by any of the other dyes. It is well to watch the ends of the cloth as it passes through the dye liquor, for if these are not completely submerged under the liquor bronze colored borders will result. This difficulty is encountered particularly when dyeing a cornflower blue and dark violet.

The sulphur coloring matters aer very interesting because of their cheapness and their fastness. The coloring bath is mixed with Glauber salt in order to increase the affinity of the coloring matter for the fibers, and the amount added varied between 5 and 20 per cent in accordance with the character of the dyestuff employed.

In dyeing with the vat colors it is very essential to see that the color bath is maintained at the temperature which is indicated by the dye manufacturer for the particular dyestuff. This is really the most important point in the entire dyeing process.

DYESTUFF TABLES

(*Continued from page* 811)

USUAL METHOD OF DYEING: Glauber salt, acetic, sulphuric and 2½ per cent chrome.

SHADE: Brown, with a strong violet tone.

SHADE BY GASLIGHT: Redder.

SOLUBILITY: Good.

LEVEL: Dyes level with care.

EXHAUSTS: Better than S-88.

FASTNESS TO:

Acid: Fast.
Alkali: Fast.
Carbonizing: Fast.
Cross-Dyeing: Moderate.
Fulling: Very good against white wool and cotton.
Light: Excellent.
Perspiration: Moderate.
Potting: Moderate; same as S-88.
Rubbing: Fast.
Steaming: Fast.
Washing: (See under "Fulling.")

DYED BY OTHER METHODS: In order to get dyeings absolutely fast to fulling it is necessary to use 2½ per cent of chrome.

ON UNIONS: Cotton-effect threads are left a pure white.

COMPETING PRODUCTS: Made in the United States by Grasselli Dyestuff Corporation.

FAST ACID BLUE BGA

(Old name Cyananthrol BGAOO)

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: Glauber salt, acetic and sulphuric acid.

SHADE: Greener than Anthracyanine 3FL.

SHADE BY GASLIGHT: Greener.

SOLUBILITY: Excellent.

LEVEL: Dyes level, though inferior to S-858

EXHAUSTS: Fairly well; not clear.

FASTNESS TO:

Acid: Somewhat redder with sulphuric acid.
Alkali: Greener with ammonia. Inferior to Wool Fast Blue BL.
Fulling: Moderate; inferior to Wool Fast Blue BL.
Ironing: Fast.
Light: Superior to Wool Fast Blue BL. Inferior to S-858.
Perspiration: Fast to acid perspiration.
Rubbing: Fast.
Steaming: Fast steamed for one-half hour at 20 pounds' pressure.
Washing: Moderate; inferior to Wool Fast Blue BL.

OTHER PROPERTIES: Faster to milling when top-chromed.

DYED BY OTHER METHODS: On a chrome mordant the dyeings are somewhat duller than dyed direct. Top-chromed, the dyeings are greener. Principally used for fashion shades on ladies' dress goods.

ON UNIONS: On gloria the silk is not covered sufficiently.

ON OTHER MATERIALS: Silk: Bath of boiled-off liquor broken with sulphuric acid. Color exhausts completely. The dyeings are almost fast to water. Cotton-effect threads are left white.

COMPETING PRODUCTS: Made in the United States by Newport Chemical Works, Inc.

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A series of lectures on the dyestuffs and dyeing industries, arranged by the Dyers' Company will be held in London during the winter. Sir Max Muspratt opened the series with an address on "How Dyes Are Made." On November 19 Dr. E. E. Ehrhardt spoke on "The Patent Law As It Affects the Dye-Making and Dye-Using Industry."

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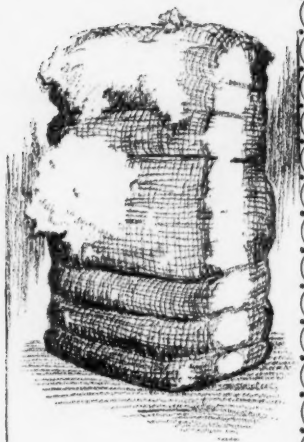

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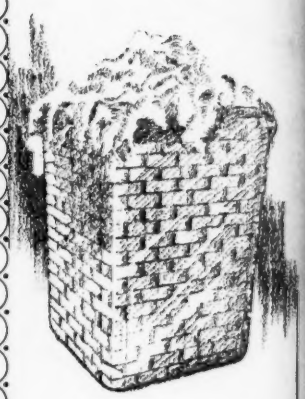

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